AD-A056 546 O'BRIEN AND GERE ENGINEERS INC PHILADELPHIA PA JUSTIN--ETC F/G 13/2
PHASE I INSPECTION REPORT. NATIONAL DAM SAFETY PROGRAM. DOUGHTY--ETC(U)
MAY 78 J J WILLIAMS
DACW61-78-C-0052

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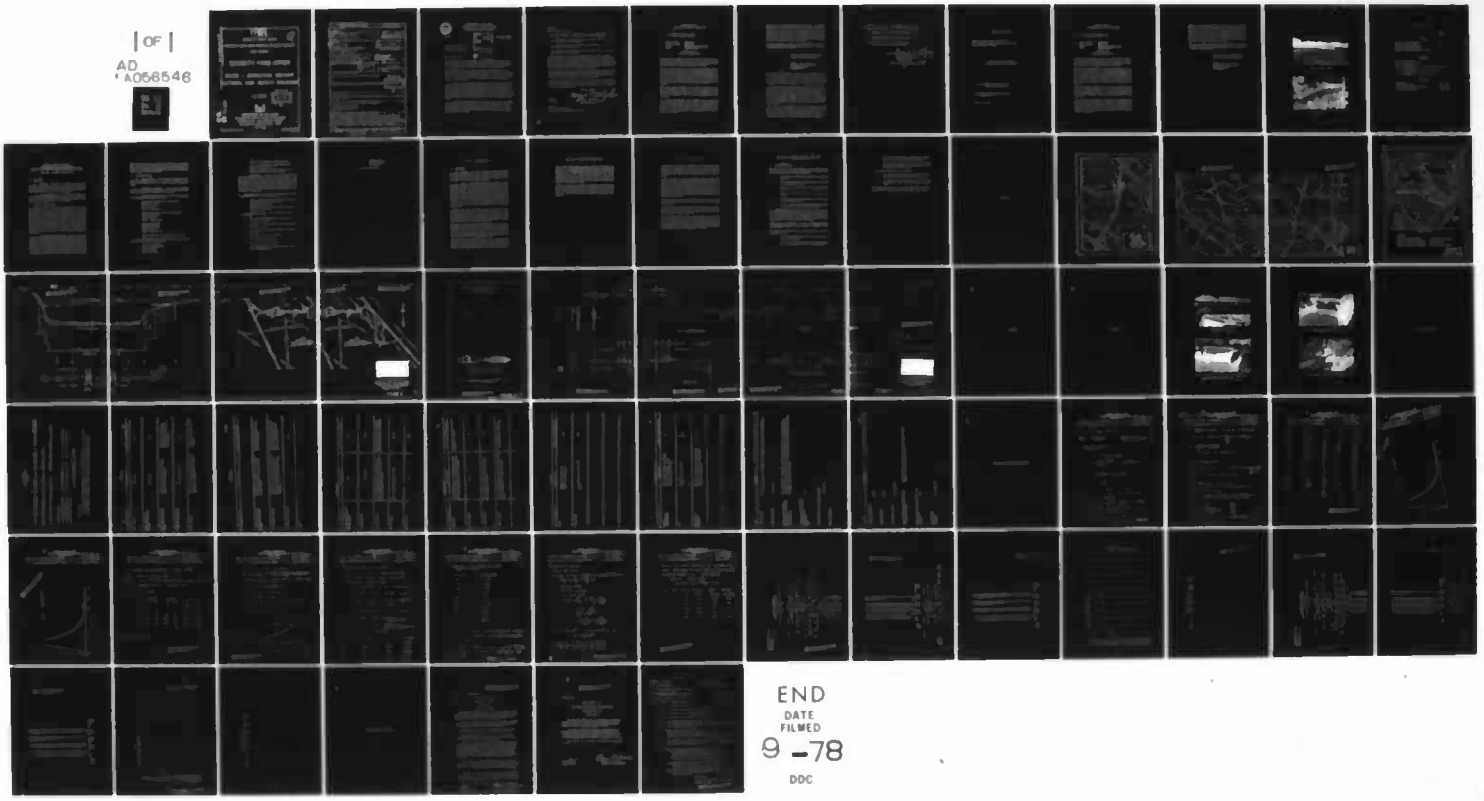

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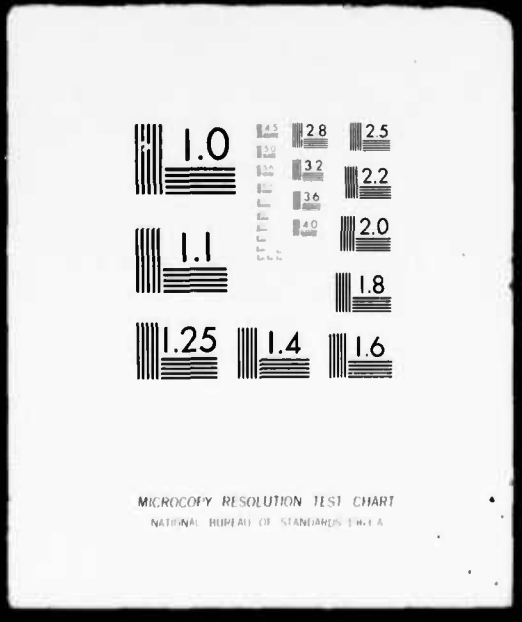

LEVEL II

ABSECON CREEK BASIN

ABSECON CREEK WEST BRANCH, ATLANTIC COUNTY

NEW JERSEY

DOUGHTY POND UPPER

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NJ 00081

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

MAY 1978

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00081 (6)
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)*: (6) Phase I Inspection Report, National Dam Safety Program, Doughty Pond Upper, Atlantic County, ~~NJ~~ New Jersey.
5. TYPE OF REPORT & PERIOD COVERED: (9) FINAL rept.
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7. AUTHOR(s): (10) John J. Williams, P.E. (10)
8. CONTRACT OR GRANT NUMBER(s): (15) DACW61-78-C-0052
9. PERFORMING ORGANIZATION NAME AND ADDRESS: O'Brien & Gere Engineers Inc., Justin & Courtney Division, 1617 J.F.Kennedy Blvd., Phila., PA 19103
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Engineer District, Philadelphia, Custom House, 2d & Chestnut Streets, Philadelphia, Pennsylvania 19106
12. REPORT DATE: (11) MAY 1978
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18. SUPPLEMENTARY NOTES: Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.
19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*: National Dam Safety Program, Dam Inspection Report Phase I, Doughty Pond Upper Dam, N.J., Dams - N.J.
20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*:

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

03 JUL 1978

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Doughty Pond Upper Dam in Atlantic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given on the first three pages of the report.

Based on visual inspection, available records, calculations and past operational performance, Doughty Pond Upper Dam is judged to be in fair condition. However, the spillway is considered to be seriously inadequate as the Probable Maximum Flood (PMF) would overtop the embankment by 3.0 feet. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Hydrologic and hydraulic investigations, and engineering studies should be initiated within three months of the date of approval of this report to determine corrective action required to increase the capacity of the spillway and obtain adequate freeboard to prevent overtopping of the dam by wave action. Construction of an improved spillway and embankment overtopping protection should commence in calendar year 1979. Due to the potential for overtopping of the dam, a detailed emergency operation and warning system should be developed by the owner within the next two months.

b. Engineering investigations should be initiated within four months of the date of approval of this report to determine the cause of embankment settlement adjacent to the spillway and the condition of the two 24-inch drain pipes including the sluice gates. Any corrective action deemed necessary as a result of these investigations should be initiated during calendar year 1979.

NAPEN-D
Honorable Brendan T. Byrne

c. Within one year of the date of approval of this report, the below noted actions should be initiated and substantially completed:

(1) Protection of the downstream seepage area to prevent migration of fine material from the embankment.

(2) Removal of trees and brush from the embankment and replacement thereof with suitable ground cover.

(3) Repair of the seriously spalled portions of the concrete wingwalls and access walkway planking.

Two copies of the report are being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman William J. Hughes of the Second District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, thirty days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia, 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,

Harry V Dutchyshyn

1 Incl
As stated

HARRY V. DUTCHYSHYN
Colonel, Corps of Engineers
District Engineer

Cy furn:
Mr. Dirk C. Hofman, P.E.
Department of Environmental Protection

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Doughty Pond Upper Dam

State Located	New Jersey
County Located	Atlantic
Stream	West Branch Absecon Creek
Date	March 17, 1978

ASSESSMENT OF GENERAL CONDITIONS

According to the available drawings, the Doughty Pond Upper Dam is an earth embankment constructed with a clay core and a timber sheet pile seepage barrier. A bridged concrete weir spillway with a center pier bridge support is located near the center of the dam.

The dam was constructed with a 3-foot freeboard from the spillway crest to the top of the dam. The normal freeboard requirement for a reservoir with a one mile fetch is 5 feet (Design of Small Dams, page 274). The freeboard at Doughty Pond Upper Dam is inadequate to meet this criterion. Therefore, high winds could cause overtopping of the embankment with reservoir elevations at or below the crest of the spillway. The spillway is inadequate, since discharge from the Probable Maximum Flood (PMF) would overtop the embankment by 3.0 feet.

Trees with trunk diameters up to 2 feet are growing in the downstream embankment slope, and, in addition to being a potential source of seepage, are indicative of a lack of proper preventive maintenance. Seepage is visible at the toe of the embankment on the left side of the spillway. The source of the seepage could not be identified.

The concrete training walls and the bridge pier are spalled and deteriorated above the spillway crest elevation. No assessment was possible below the spillway crest level on the date the inspection was made. The condition of the reservoir drain pipes and gates was not observed nor was the operation of the gates tested during the inspection. The operating stems for the gates were not in place at the time of inspection.

Based on the visual examination and the review of available information, the dam appeared to be in fair condition. However, no inspection was made of underwater features or the interior of the embankment. The nature of the investigation does not permit assurance that there are not latent or hidden defects in the dam or that there will not be occurrences subsequent to the inspection which might lead to a failure of the dam. No responsibility can, therefore, be assumed for lack of integrity of the structure from unpredictable causes or those beyond the scope of this report.

In view of these factors, further detailed investigations, as outlined in the National Program of the Inspection of Dams, Volume I, Appendix D, Chapter 4, are recommended.

O'BRIEN & GERE ENGINEERS, INC.
JUSTIN & COURTNEY DIVISION

John J. Williams

John J. Williams, P.E.
Vice President

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b. Engineering investigations should be initiated within four months of the date of approval of this report to determine the cause of embankment settlement adjacent to the spillway, and the condition of the two 24-inch drain pipes including the sluice gates. Any corrective action deemed necessary as a result of these investigations should be initiated during calendar year 1979.

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(2) Removal of trees and brush from the embankment and replacement thereof with suitable ground cover.

(3) Repair of the seriously spalled portions of the concrete wingwalls and access walkway planking.

APPROVED: Harry V Dutchyshyn

HARRY V. DUTCHYSHYN
Colonel, Corps of Engineers
District Engineer

DATE: 29 June 1978

ABSECON BAY BASIN

Name of Dam: Doughty Pond Upper Dam
County and State: Atlantic County, State of New Jersey
Inventory Number: NJ 00081

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by: O'Brien & Gere Engineers, Inc.
Justin & Courtney Division

For: United States Army Corps of Engineers
Philadelphia District

Date: June 19, 1978

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Doughty Pond Upper Dam

State Located	New Jersey
County Located	Atlantic
Stream	West Branch Absecon Creek
Date	March 17, 1978

ASSESSMENT OF GENERAL CONDITIONS

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The concrete training walls and the bridge pier are spalled and deteriorated above the spillway crest elevation. No assessment was possible below the spillway crest level on the date the inspection was made. The condition of the reservoir drain pipes and gates was not observed nor was the operation of the gates tested during the inspection. The operating stems for the gates were not in place at the time of inspection.

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In view of these factors, further detailed investigations, as outlined in the National Program of the Inspection of Dams, Volume I, Appendix D, Chapter 4, are recommended.

O'BRIEN & GERE ENGINEERS, INC.
JUSTIN & COURTNEY DIVISION

John J. Williams

John J. Williams, P.E.
Vice President

OVERALL VIEW OF DAM

SPILLWAY

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM DOUGHTY POND UPPER DAM ID# NJ00081

SECTION 1 - PROJECT DESCRIPTION

1.1 GENERAL

a. Authority - This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with contract #DACW 61-78-C-0052 between O'Brien & Gere Engineers, Inc., Justin & Courtney Division, and the United States Army Corps of Engineers, Philadelphia District.

b. Purpose of Inspection - The purpose of this inspection is to evaluate the structural and hydraulic condition of the Doughty Pond Upper Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 PROJECT DESCRIPTION

a. General - Doughty Pond Upper Dam, constructed in 1935, is located about 1.7 miles west of Absecon, New Jersey, on the South Branch of Absecon Creek. It is owned and operated by the City of Atlantic City for municipal water supply. According to the drawings supplied by the New Jersey Department of Environmental Protection, the dam is an earth embankment with a clay core and a timber sheet pile seepage barrier. The concrete spillway is an ungated overflow section located near the center of the dam. The upstream slope is covered with concrete block slope protection. The downstream slope is overgrown with large trees and undergrowth. A gravel road is located on the dam crest, and a two span concrete bridge is constructed over the spillway. According to the drawings, the reservoir can be drained through two cast iron drain pipes founded on timber piles.

b. Size and Hazard Classification - The maximum storage capacity of the reservoir (to the crest of the embankment) is about 1300 acre-feet, and the maximum height of the dam is about 14 feet. The dam is located about 200 feet upstream of the Garden State Parkway. The Parkway's embankment and twin bridges spanning the South Branch of Absecon Creek, including the flood plain, are at an elevation above the top of dam. The upper extent of the Absalom Doughty Reservoir is about 300 feet downstream of the dam. Failure of the Doughty Pond Upper Dam would adversely affect the Garden State Parkway embankment and bridge and the Absalom Doughty

Dam, whose reservoir is located 100 feet downstream of the Garden State Parkway. Therefore, the dam is in the high hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams, and the design flood recommended to be used by the Guidelines is the Probable Maximum Flood (PMF).

1.3 PERTINENT DATA

a. Drainage Area - The drainage area upstream of the Doughty Pond Upper Dam is about 8.7 square miles (determined from United States Geologic Survey 7.5 minute Pleasantville quadrangle sheet).

b. Discharge at Damsite - The calculated spillway capacity for maximum pool is about 300 cubic feet per second (cfs). Discharge records are not available for this structure.

c. Reservoir Data (obtained from United States Geological Survey quadrangle sheet 7.5 minute series) -

Normal pool (reservoir at crest of spillway)
Elevation - 25.0 feet
Length - 6500 feet
Area - 130 acres
Volume - 765 acre-feet

Top of dam (reservoir at crest of embankment)
Elevation - 28.0 feet
Length - 8000 feet
Area - 230 acres
Volume - 1300 acre feet

Maximum pool (PMF)
Elevation - 31.0 feet
Length - 11,000 feet
Area - 330 acres
Volume - 2100 acre-feet

Note: Design flood overtops embankment by 3 feet

d. Dam Data (from the drawings supplied by New Jersey Department of Environmental Protection)-

Top of dam - 28.0 feet
Type - earth embankment
Length - 650 feet
Height - 14 feet
Top width - 20 feet

Side slopes - 3 horizontal: 1 vertical (upstream)
2 horizontal: 1 vertical (downstream)
Zoning - sand fill with clay core
Impervious core-clay
Cutoff - timber sheet piling the length of dam with interlocking steel sheet pile under spillway

e. Outlet Data - According to the drawings furnished, the outlet facilities are located on either side of the spillway. The facilities consist of two 24-inch diameter cast iron drain pipes supported on wood piles, constructed in the embankment adjacent to the spillway wing walls, and discharge onto the concrete apron below the spillway. The operating assemblies for the valves were not on site at the time of inspection. Mr. McLees, Superintendent of the Atlantic City Water Department stated that the assemblies are now in place and are operational.

f. Spillway Data (taken from the drawings supplied by the New Jersey Department of Environmental Protection)

Type - concrete overflow weir with steel sheet piling foundation support and seepage barrier.
Length of weir - 25 feet
Crest elevation - 25.0 feet
Downstream channel - 12-foot concrete apron and South Branch of Absecon Creek

g. Engineering Data - The information available for review included:

(1) A location Plan, and Plan and Elevation of the embankment (Figure 4)

(2) A Plan, Elevation, and Sections of the embankment (Figure 5)

(3) Plan, Elevation, and Sections of the spillway (Figure 6)

(4) Revised Plan of slope protection

(5) Revised design for spillway

(6) Plan of the dam and reservoir

(7) Correspondence concerning the dam, including inspection reports dated :

August 1, 1969
September 5, 1944
April 22, 1942

(See pages A31 through A33)

SECTION 2 - VISUAL INSPECTION

2.1 FINDINGS

a. General The field inspection of Doughty Pond Upper Dam took place on March 17, 1978. A complete and detailed visual examination of the spillway concrete could not be made at the time of inspection due to water discharging over the spillway from the reservoir. No underwater areas were inspected.

b. Dam - The embankment material appears to consist primarily of sand, with some gravel and clay, and with a gravel surface on the crest. The drawings indicate embankment slopes of 3:1 (horizontal to vertical) for the upstream face and 2:1 for the downstream face. The slopes appear to be consistent with the drawings. The top of dam is about 20 feet wide. The upstream face has been protected with one-foot square concrete blocks with mortared joints. Some local spalling of the slope protection has occurred. A concrete curb about 1-foot high is located along the upstream edge of the crest of the embankment. Debris has accumulated at the junction of the upstream slope and curb wall. There is about 3 feet of freeboard between the top of dam and the spillway crest.

A seepage area was noted about 30 feet downstream of the embankment and about 150 feet to the left of the spillway. The seepage water (estimated at 2 gallons per minute) was rust colored and flowed parallel to the embankment toward the channel below the spillway. Concrete riprap is located where the seepage water flows into Absecon Creek. The downstream face of the dam has a dense cover of brush and trees up to 2 feet in diameter.

The spillway is a concrete weir 25 feet wide with a pier in the center supporting a bridge constructed over the spillway. The spillway abutments are cracked and spalled. Differential settlement of up to 3 inches was observed at the abutments. The channel directly downstream of the spillway is about 60 feet wide and conveys flow under the Garden State Parkway bridges. The bridge openings are approximately 80 feet wide and about 20 feet high.

Wood plank walkways extend into the reservoir about 30 feet upstream from the spillway abutments to permit operation of reservoir drain line valves. The operating assemblies for the valves, noted on the design drawings, were not in place at the time of inspection. The planks of the walkways were in very poor condition.

SECTION 3 - HYDRAULIC/HYDROLOGIC

The Spillway Design Flood to be used for Doughty Pond Upper Dam, according to the Recommended Guidelines for Safety Inspection of Dams, is the Probable Maximum Flood (PMF). The PMF was calculated from the Probable Maximum Precipitation; using standard reduction factors. PMF runoff increments were applied to the Soil Conservation Service curvilinear unit hydrograph. The inflow hydrograph, with a peak rate of 12,500 cfs, was routed through the reservoir. The outflow hydrograph peak is 11,900 cfs. This discharge would overtop the dam by 3.0 feet.

A drawdown analysis was performed to evaluate the time necessary to drain the reservoir through the 24 inch diameter drain pipes. With no inflow and the starting water surface elevation at the spillway crest, it is estimated that 6 days would be required to empty the reservoir. (See the Hydrologic and Hydraulic Calculations in the appendix).

SECTION 4 - STRUCTURAL STABILITY

The Doughty Pond Upper Dam is located on the gently undulating, but relatively flat and featureless, eastern edge of the exposed Atlantic Coastal Plain physiographic province. To the east lie the shallow swamps, bays and lagoons which separate this "fast land" portion of the coastal plain from the barrier beach strands and the Atlantic Ocean.

As shown on Figure 3, the dam is physically set and constructed in sands and gravels of the Quaternary Cape May formation indicated on the "State of New Jersey Geologic Map." Underlying this surficial unit, and in unconformable contact are the remanants of the Quaternary Bridgeton formation and the Tertiary Cohansey formation, the latter being the predominant substructure feature which slips very gently east and southeastward. All geologic units involved consist of predominantly cohesionless and erodible sediments with occasional clay units occurring as lenses of variable thickness and erratic areal distribution.

The dam is in siesmic zone 1 of the Seismic Zone Map of the United States. Due to the low height of the dam, the risk of seismic damage is probably low.

The condition of Doughty Pond Upper Dam is fair. The seepage area at the left of the spillway downstream of the embankment suggests that the effectiveness of the clay core and timber sheet piling as a seepage barrier may have deteriorated.

The downstream slope is heavily overgrown with large trees and brush. The freeboard for normal pool is 3-feet. Strong westerly winds could generate waves which could cause overtopping of the dam at the normal pool elevation. As evidenced by the seepage downstream of the dam, the inadequate freeboard, and the inability of the spillway to pass the design flood; the adequacy of the dam is questionable and should be investigated in more detail.

SECTION 5 - ASSESSMENT/REMEDIAL MEASURES

5.1 DAM ASSESSMENT

On the basis of the visual examination, the review of available data, and the hydrologic and hydraulic computations, the Doughty Pond Upper Dam is deficient in the following respects:

(1) Sufficient freeboard is not available for normal pool elevation.

(2) The spillway capacity is unable to pass 1/2 the PMF without overtopping the dam.

(3) Seepage is visible below the toe of the downstream slope.

(4) The embankment adjacent to the spillway has settled.

(5) Spalling, cracking and deterioration of the concrete wingwalls has occurred.

(6) The roots of trees in the downstream slope increase the seepage potential through the embankment.

5.2 REMEDIAL MEASURES - The Superintendent of the Atlantic City Water Department has stated that the repair work specified in the study by Remington and Boyd, Engineers, of Pennsauken, New Jersey, is nearing completion. The remedial work was not inspected in conjunction with this report, and the following measures are based on the condition of the dam at the time of inspection.

Further detailed investigations, as outlined in the National Program of Inspections of Dams, Volume I, Appendix D, Chapter 4, are recommended.

The following remedial measures are recommended for repair and upgrading of the dam:

(1) Extend the concrete curbing above the elevation of projected wave heights.

(2) Increase the spillway capacity by reconstructing the spillway, or extending the height of the embankment.

(3) Remove trees and brush, and replace with a suitable ground cover normally used on dam embankments.

(4) Protect the seepage area with filter fabric and/or graded filter material to prevent migration of fine material from the embankment.

The following investigations are recommended:

(1) Investiate and determine the cause of the settlement in the embankment adjacent to the spillway.

(2) Inspect the two 24 inch diameter cast iron pipes including sluice gates to check pipe joints and alignment.

More detailed investigations may uncover other problem areas not known at this time, due to the limited scope of the Phase I program.

FIGURES

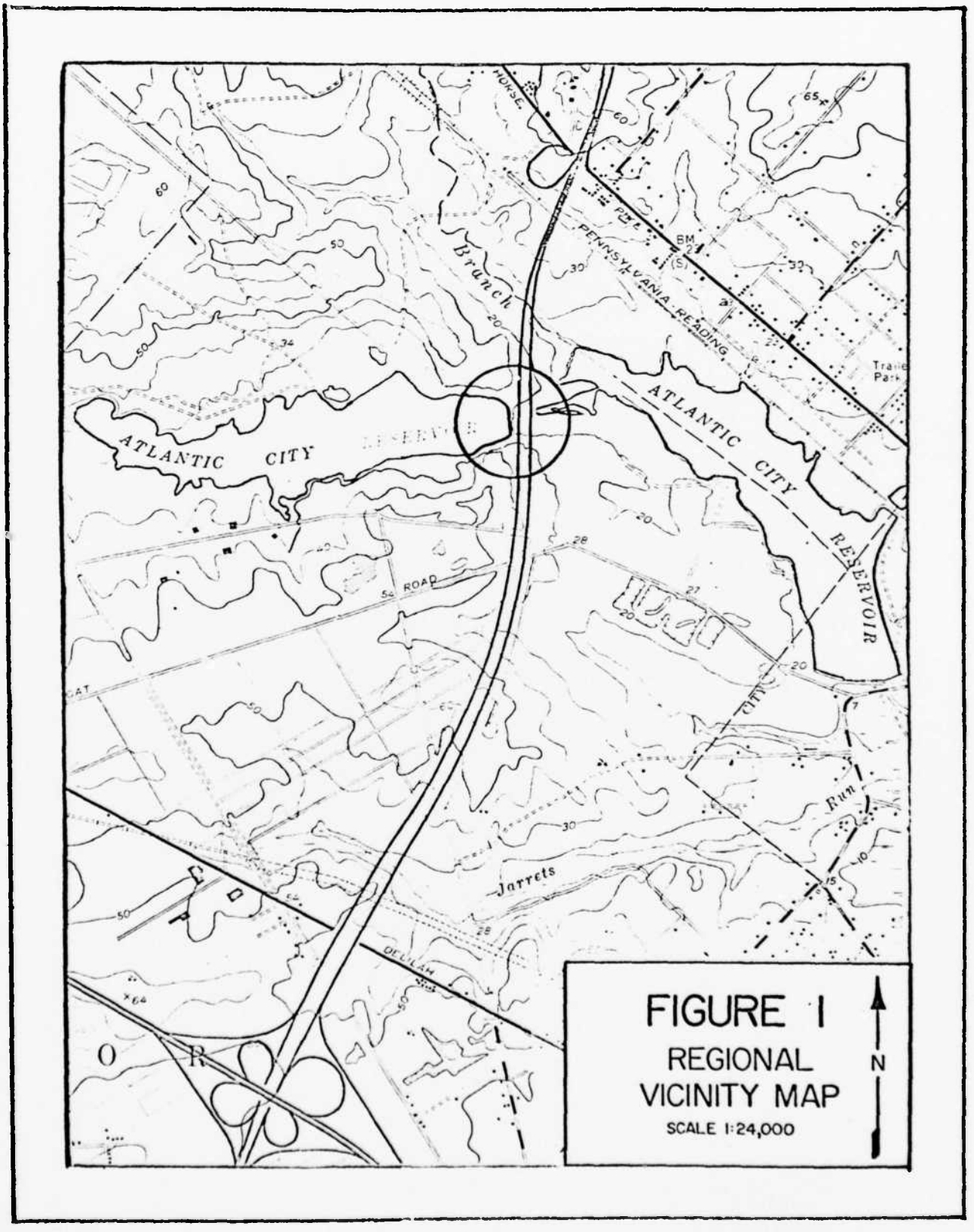
Branch
PENNSYLVANIA-READING
ATLANTIC CITY
ATLANTIC CITY RESERVOIR
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FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24,000
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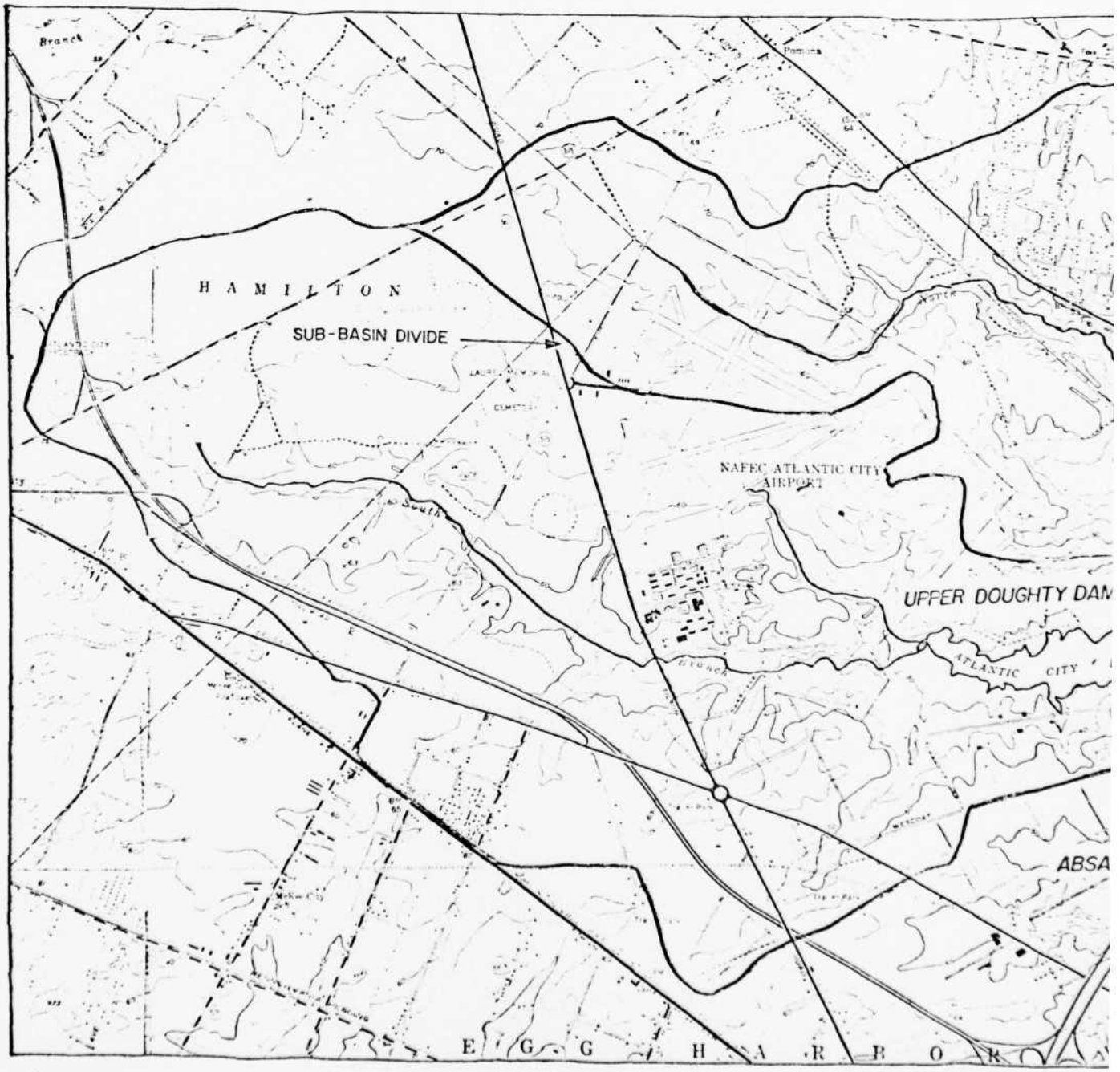

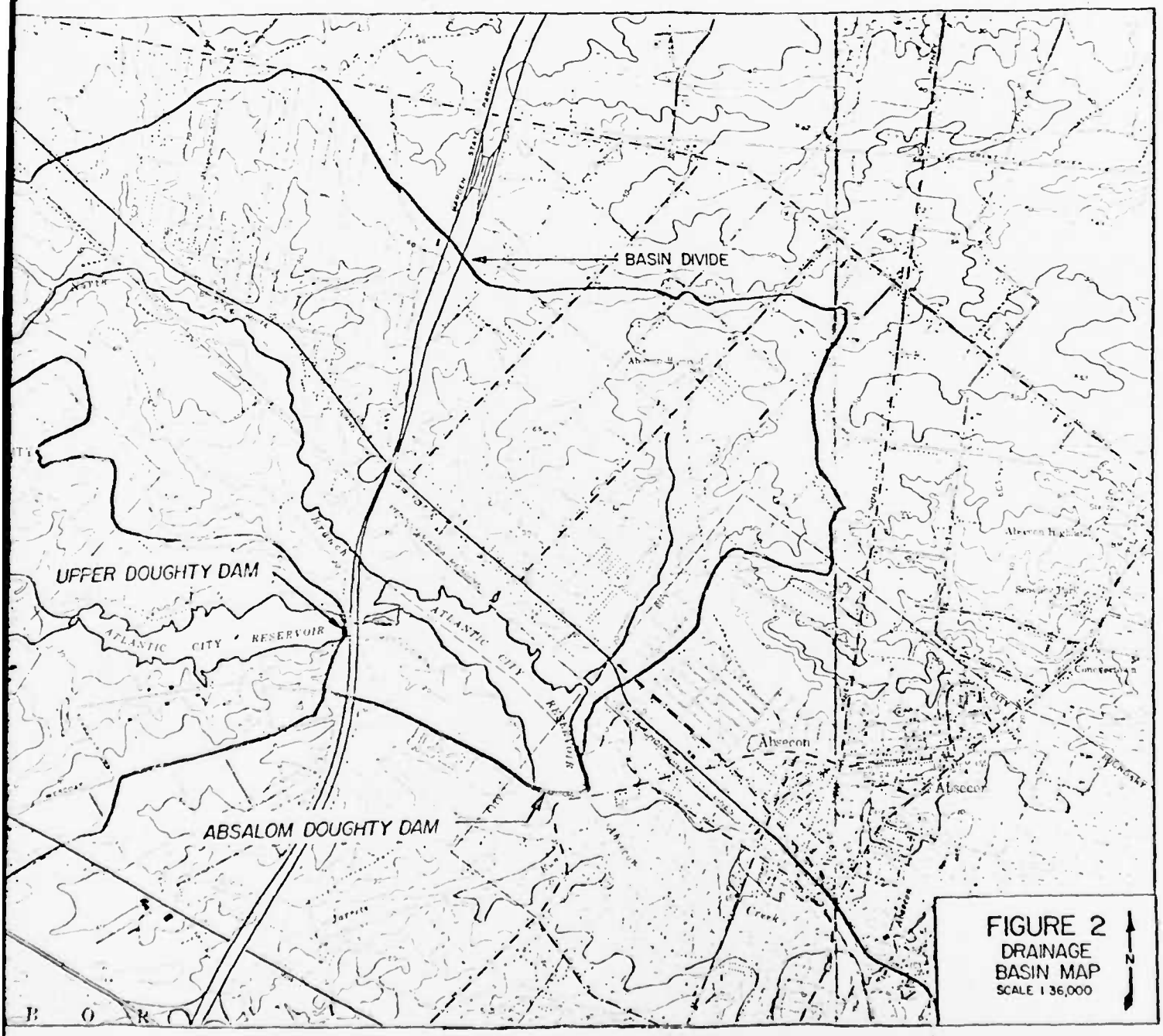

FIGURE 2
DRAINAGE
BASIN MAP
SCALE 1 36,000
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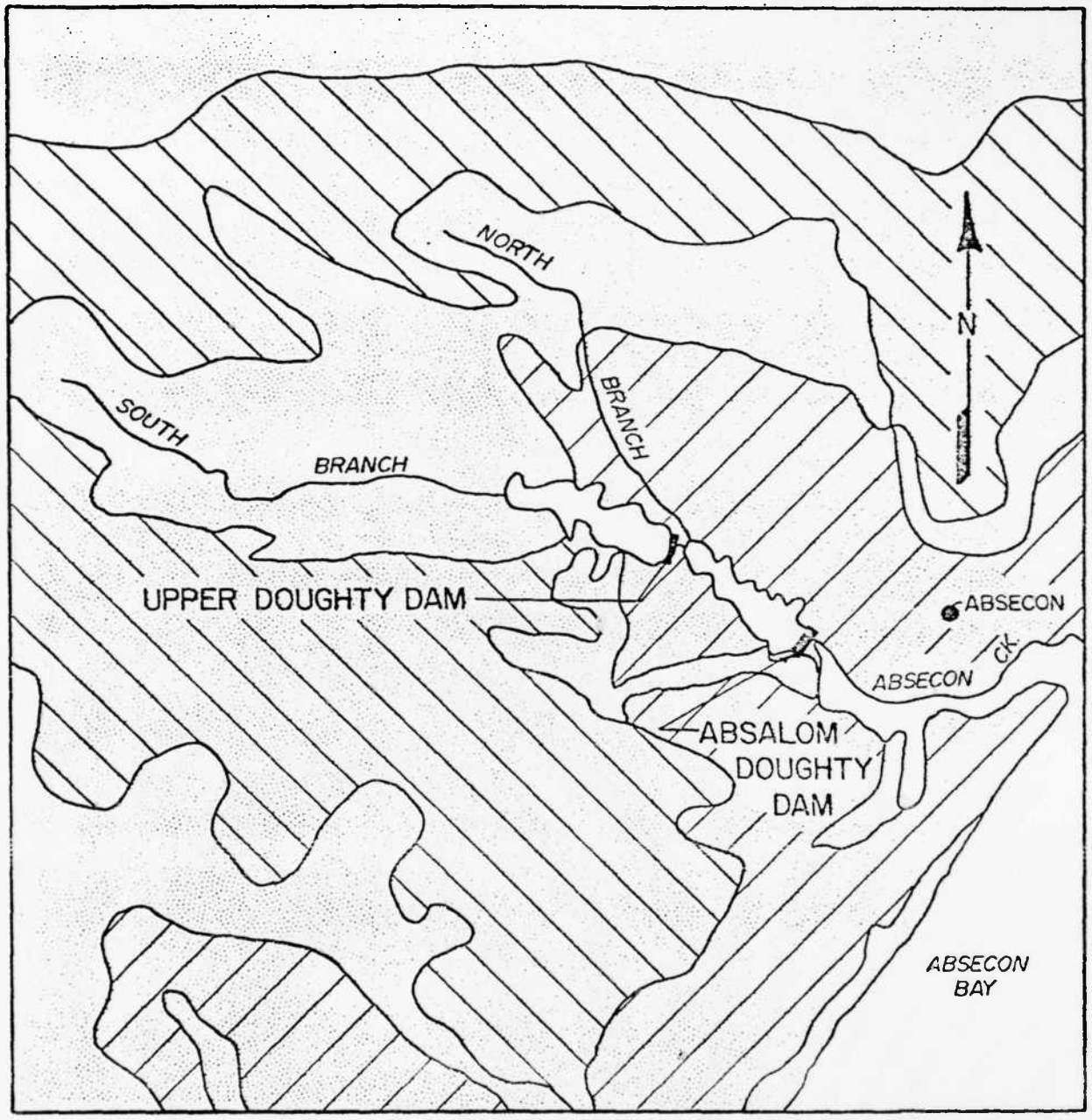


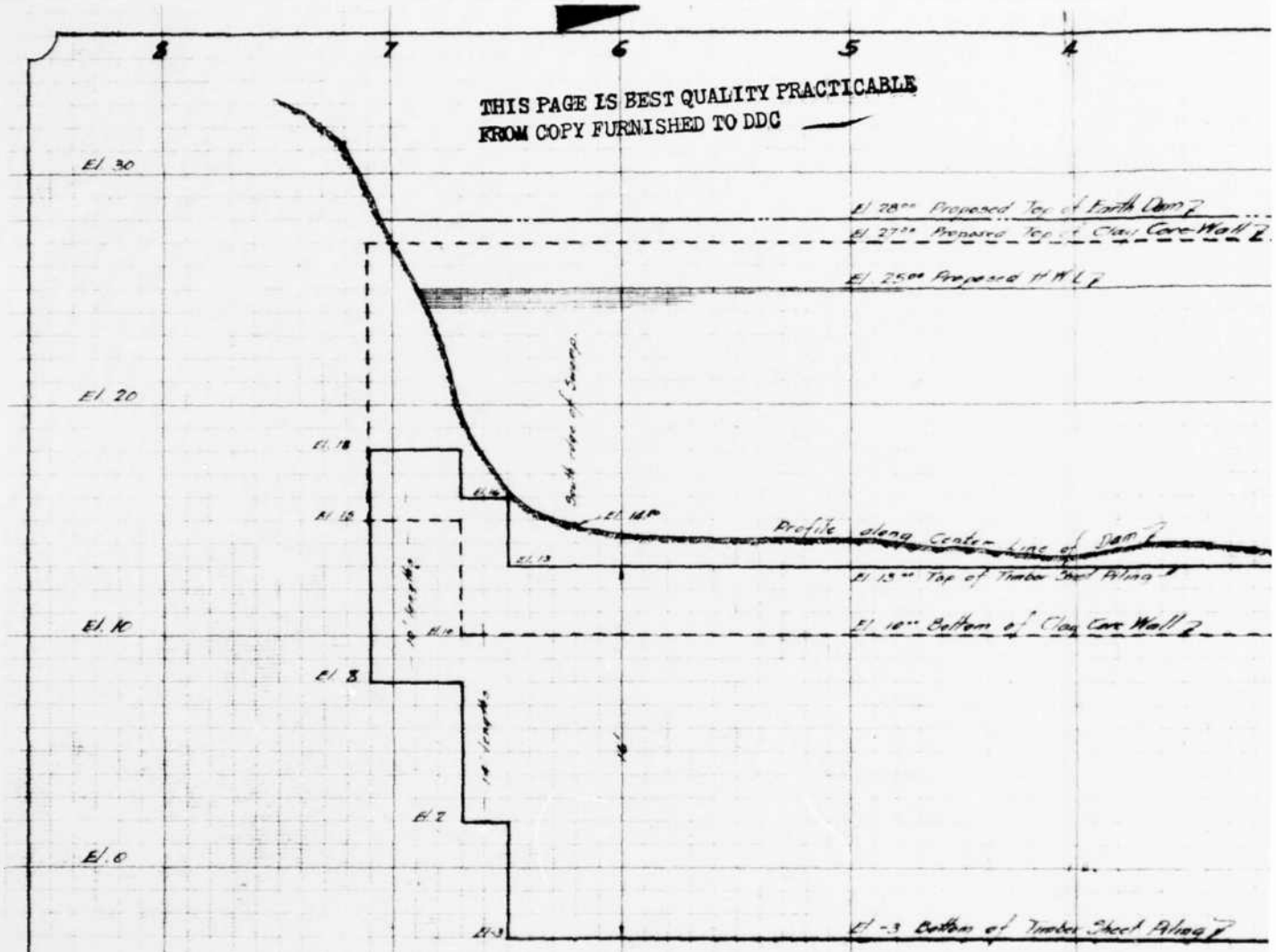
SCALE 1"= 1 MILE

LEGEND:

	COHANSEY SAND	Sand, with some clay and gravel.
	BRIDGETON FORMATION	Gravel and sand.
	CAPE MAY FORMATION	Gravel and sand with some clay.

FIGURE 3

GEOLOGIC MAP



PROFILE
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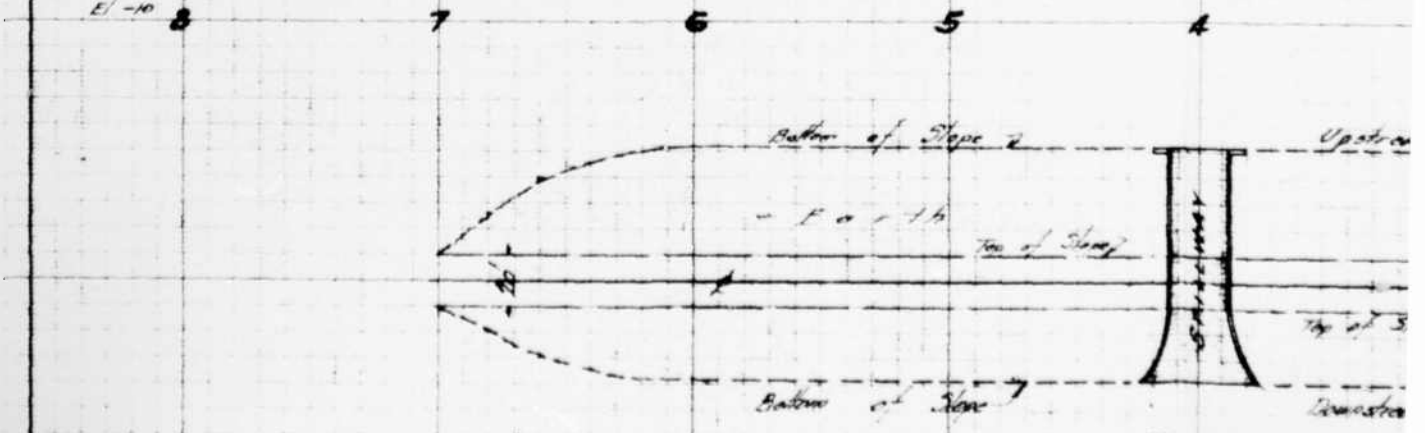
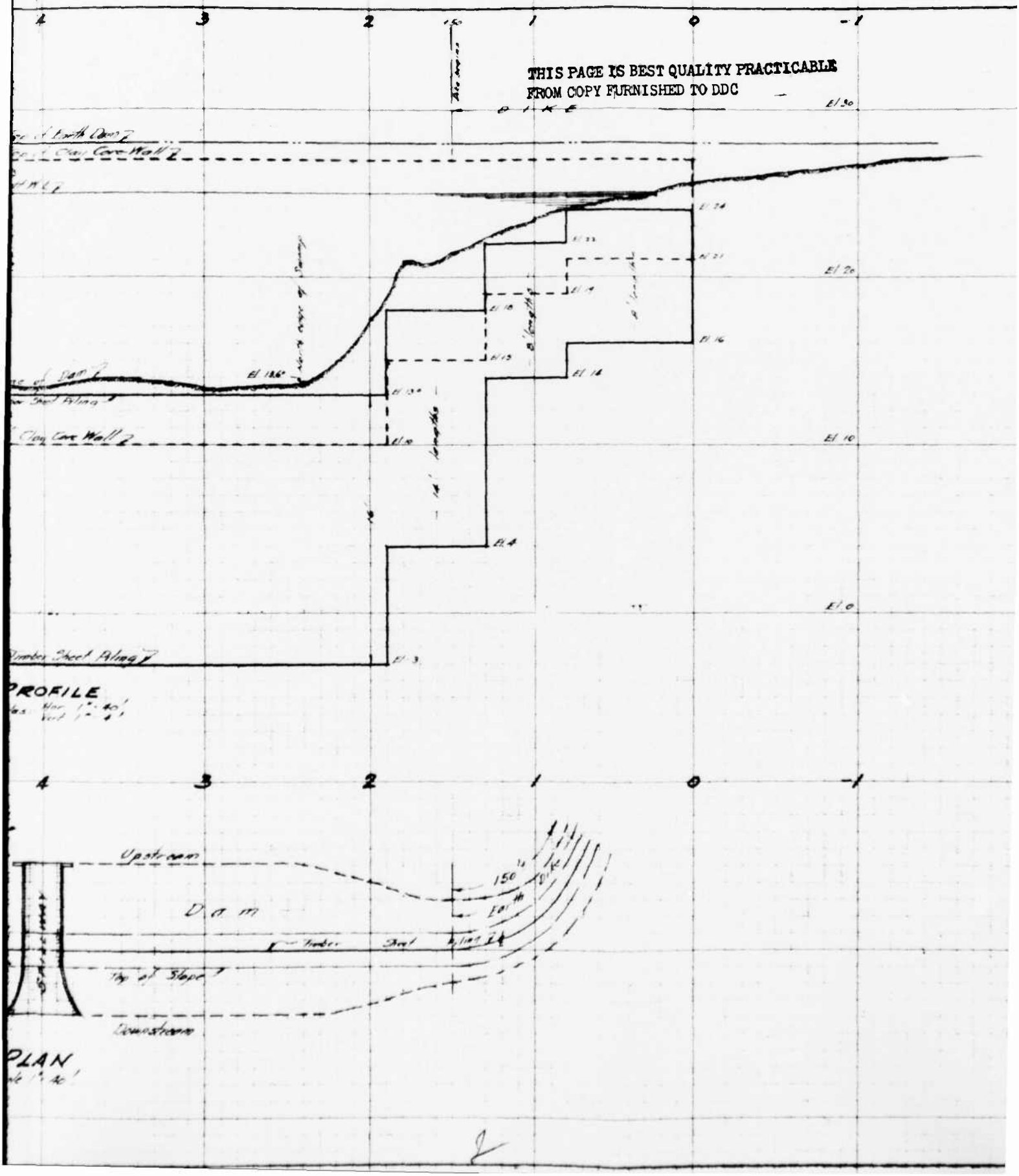
Vert 1" = 4'

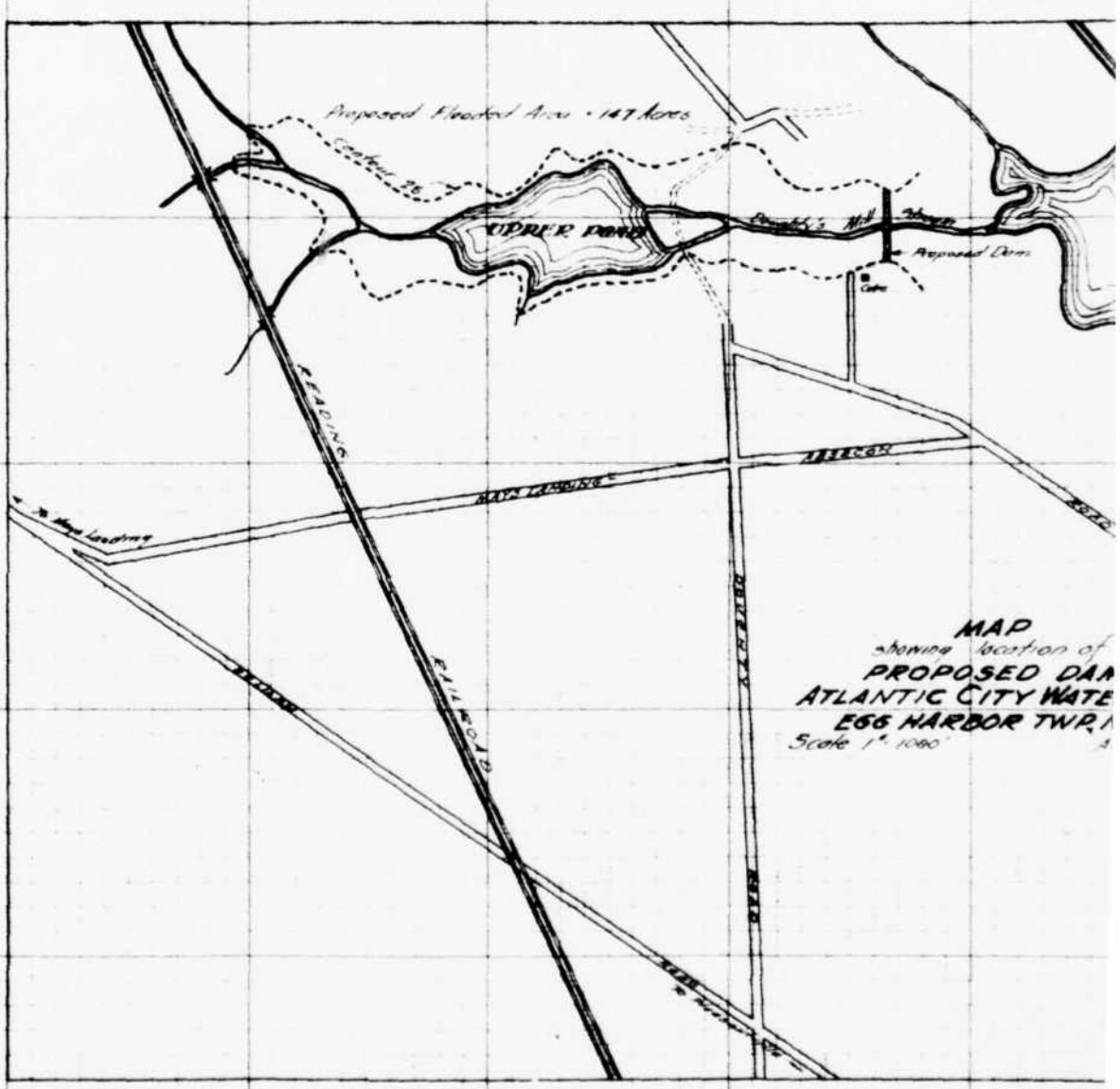


PLAN
Scale 1" = 40'

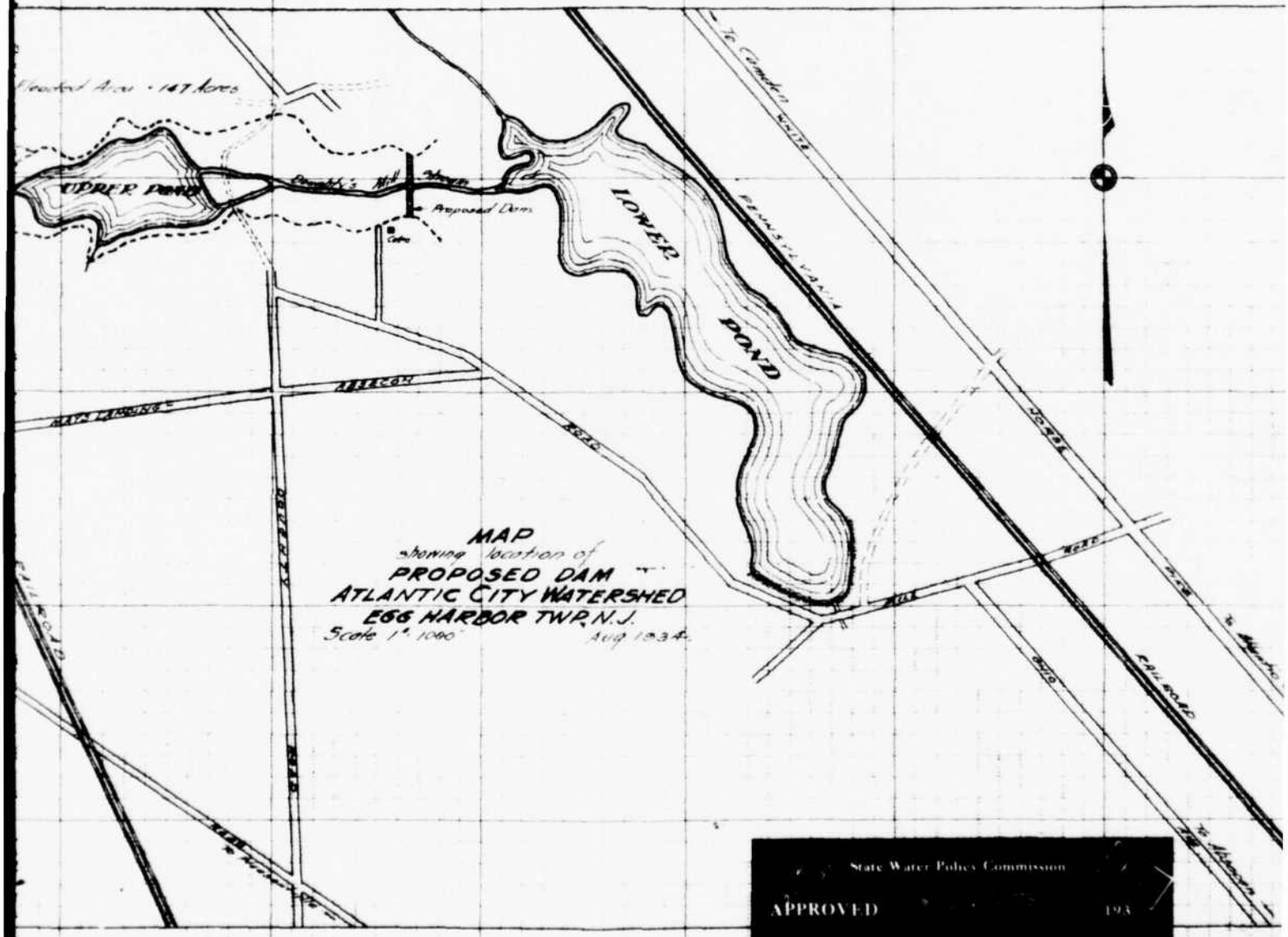


PROFILE

PLAN



MAP
showing location of
PROPOSED DAM
ATLANTIC CITY WATE
EGG HARBOR TWP.
Scale 1" 1000'



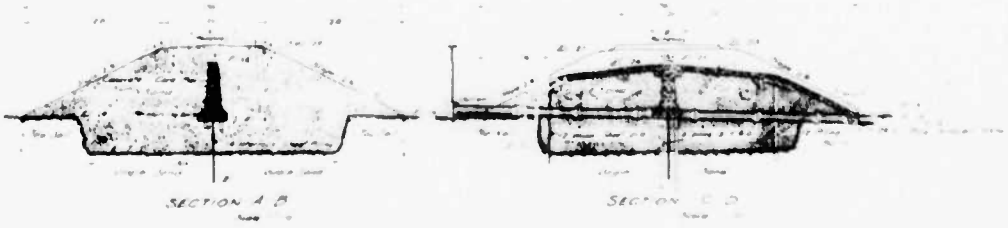
E.R.A. PROJECT No. 1-B13-7.
PROPOSED DAM AND SPILLWAY
ATLANTIC CITY WATERSHED
EGG HARBOR TWP.
ATLANTIC CO. N.J.
Scale: indicated Aug 1934.

FIGURE 4

ATLANTIC CITY WATER DEPARTMENT

PROPOSED DAM FOR

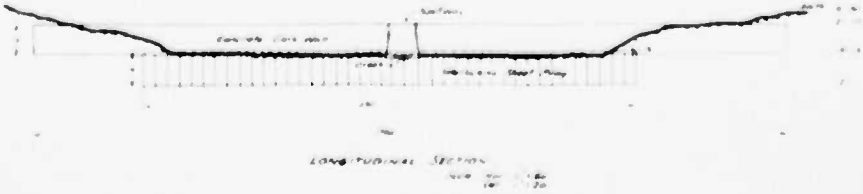
WEST BRANCH of ABSECON CREEK



SECTION A B

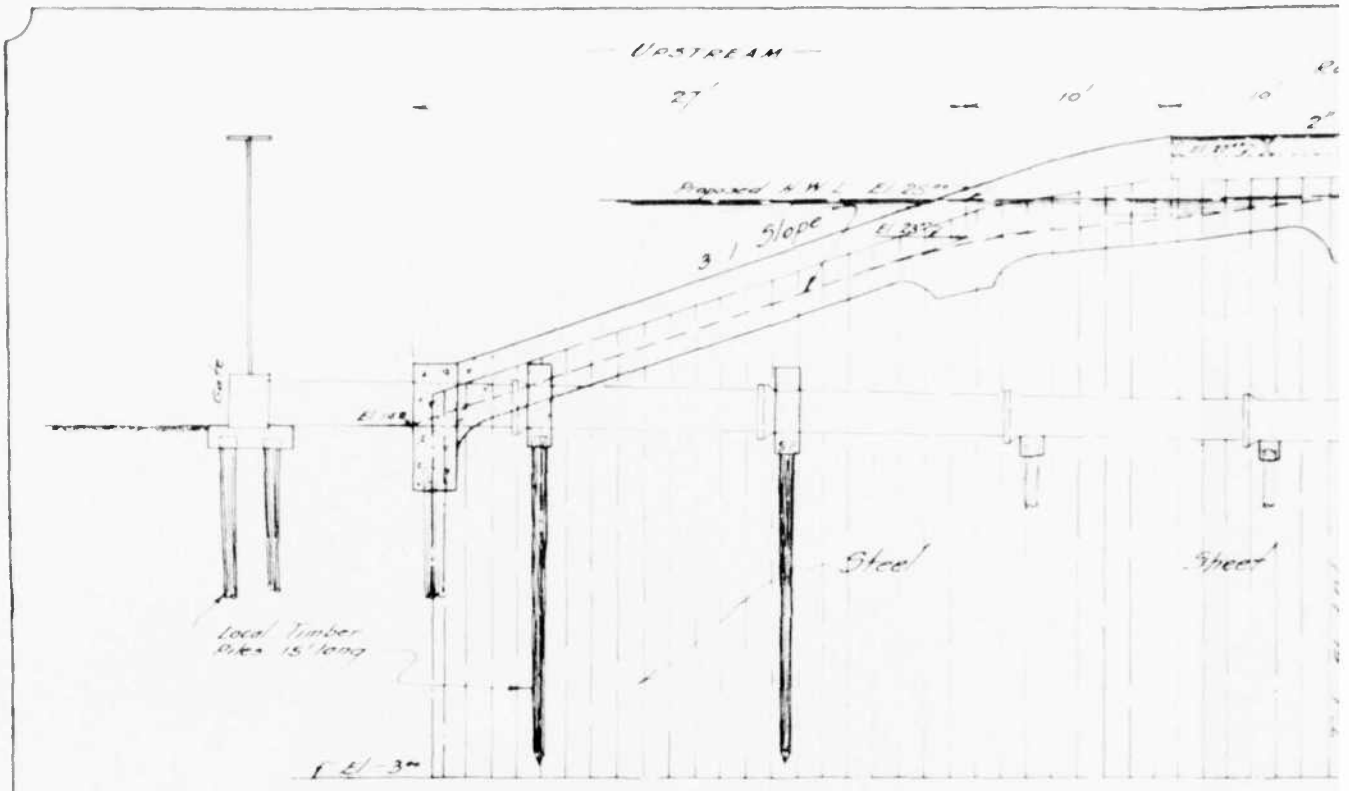
SECTION C D

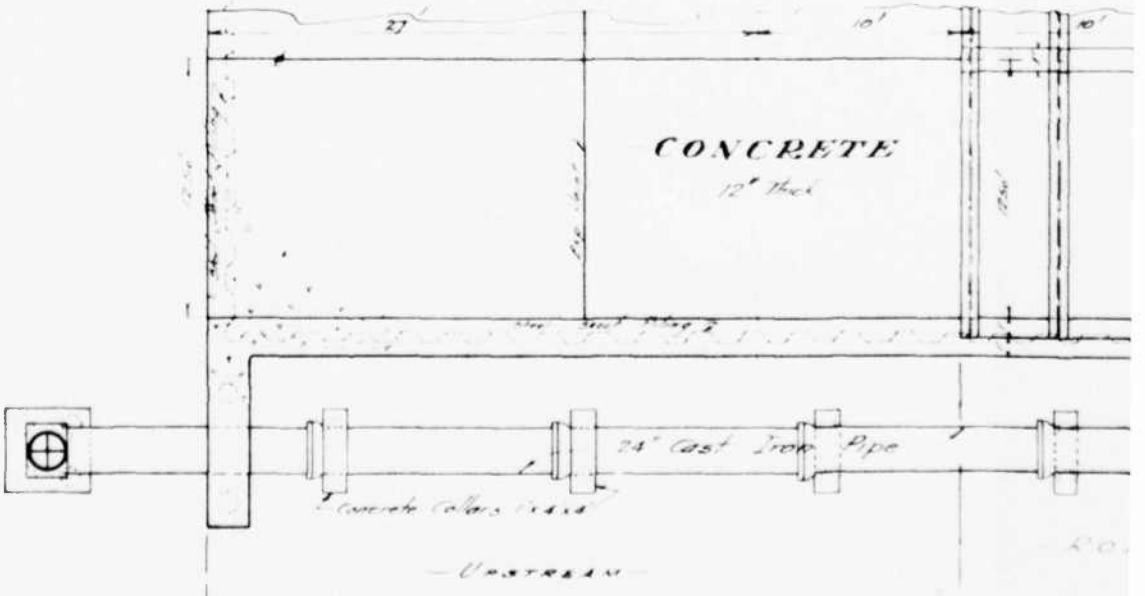
NOTE: THE EMBANKMENT WAS NOT CONSTRUCTED WITH A CONCRETE CORE AS INDICATED ON THIS DRAWING.

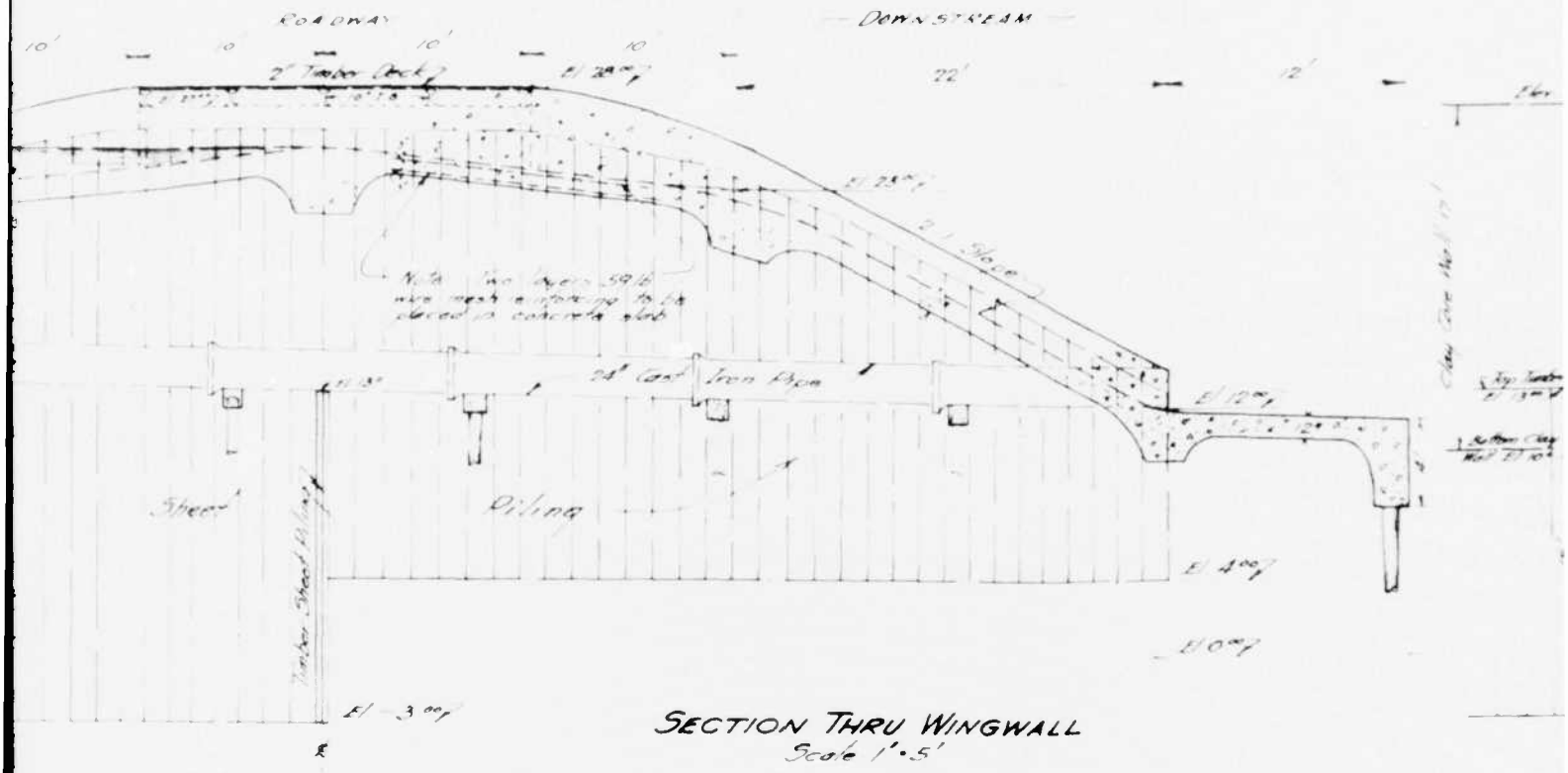


LONGITUDINAL SECTION

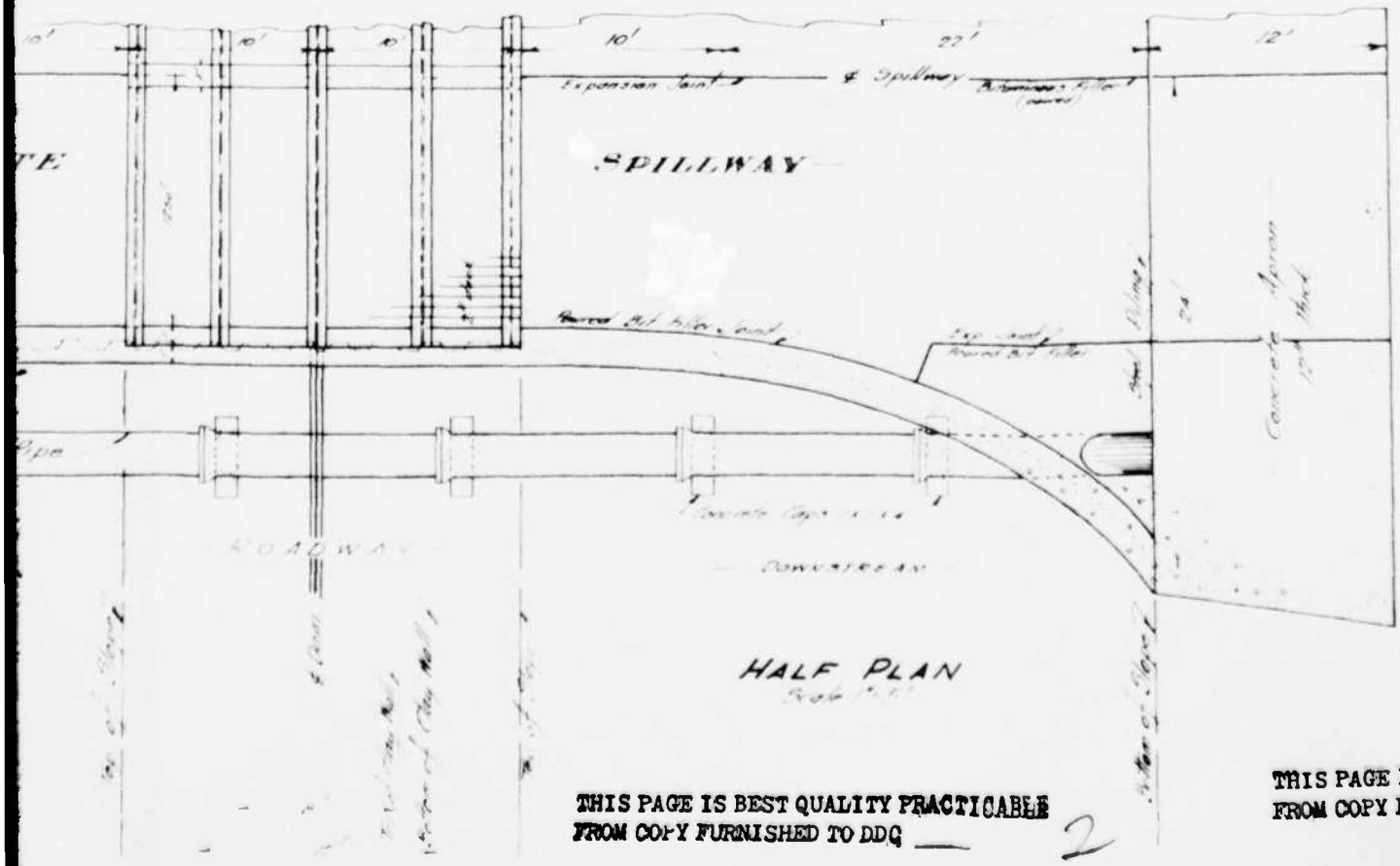
FIGURE 5





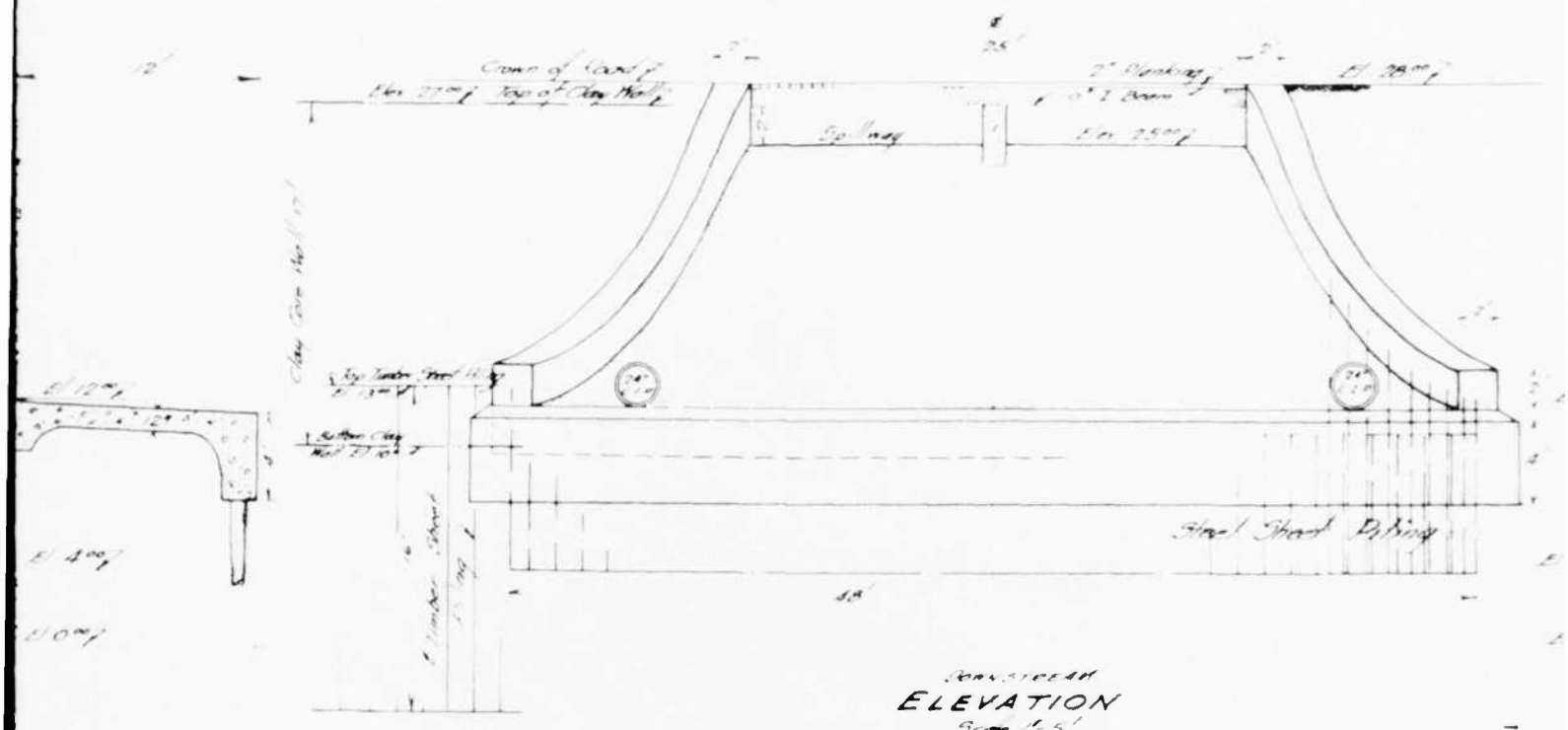


SECTION THRU WINGWALL
Scale 1"=5'

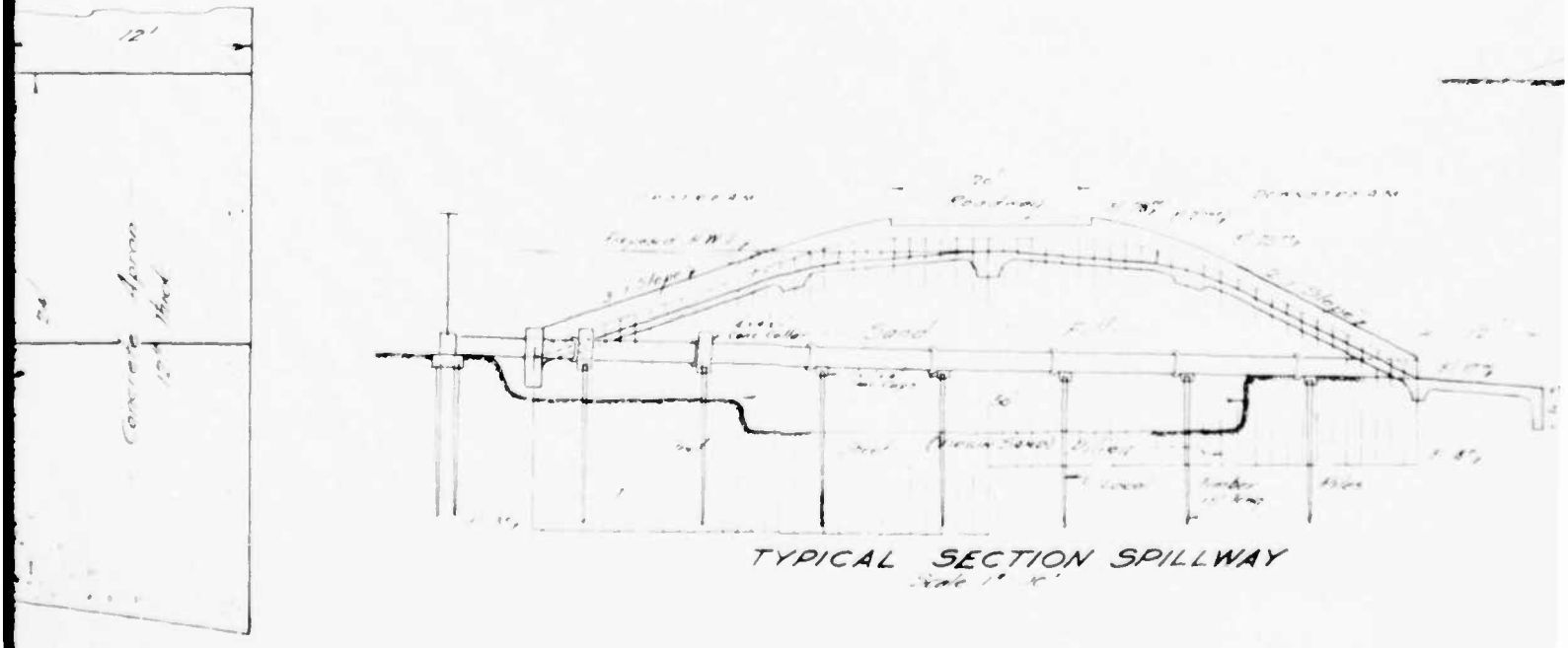


HALF PLAN
Scale 1"=5'

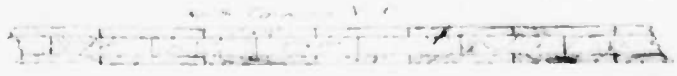
2



DOWNSTREAM
ELEVATION
Scale 1:5'



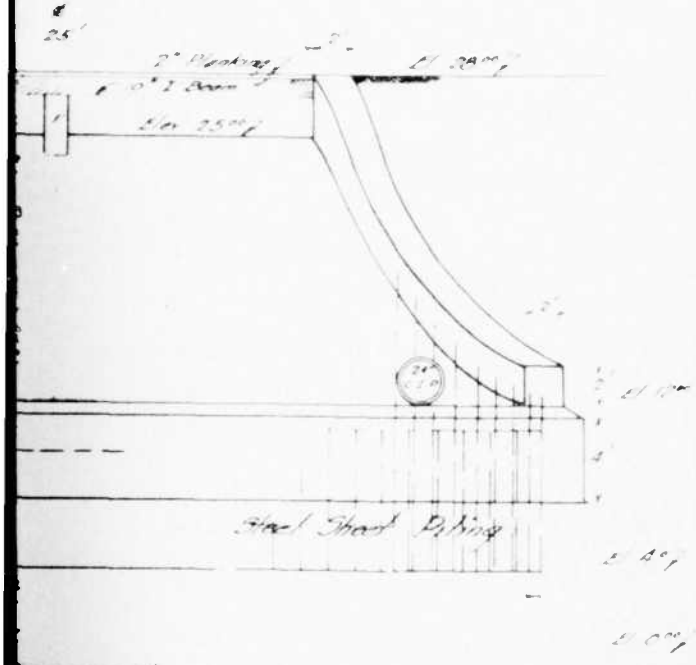
TYPICAL SECTION SPILLWAY
Scale 1" = 5'



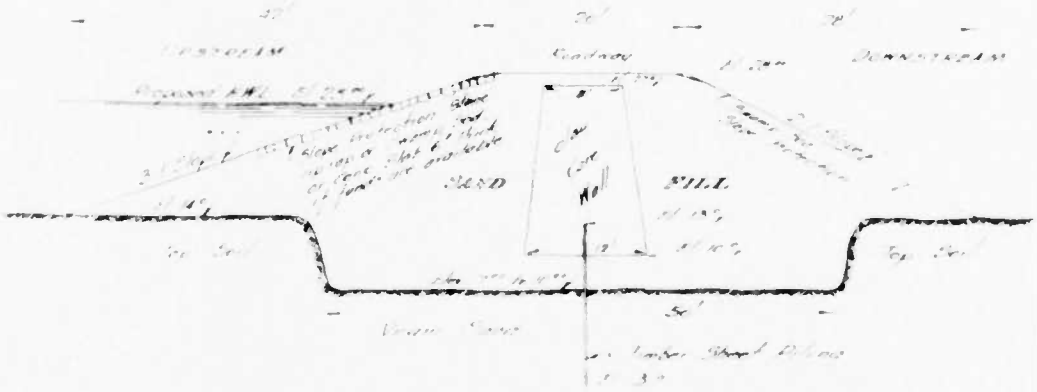
FIGUR

ESTIMATE OF QUANTITIES

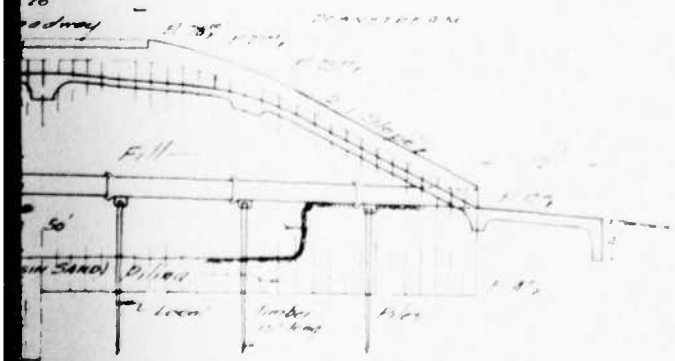
Est Steel Piling in Box under Spillway	63 Tons
Concrete in Spillway	211 Cu Yds
24" Cast Iron Pipe	32 Lin Ft
[illegible] Timber Steel Piling [illegible]	1914 Bd Ft
[illegible]	3834 Bd Ft
Clay Core Wall	3800 Cu Yds
Sand Fill	16000 Cu Yds
Excavation Top Soil	2200 Cu Yds
16" I Beams 21' long	5 Units



DOWNSTREAM
ELEVATION
Scale 1"=5'



TYPICAL SECTION DAM
Scale 1"=10'



SECTION SPILLWAY
1"=10'

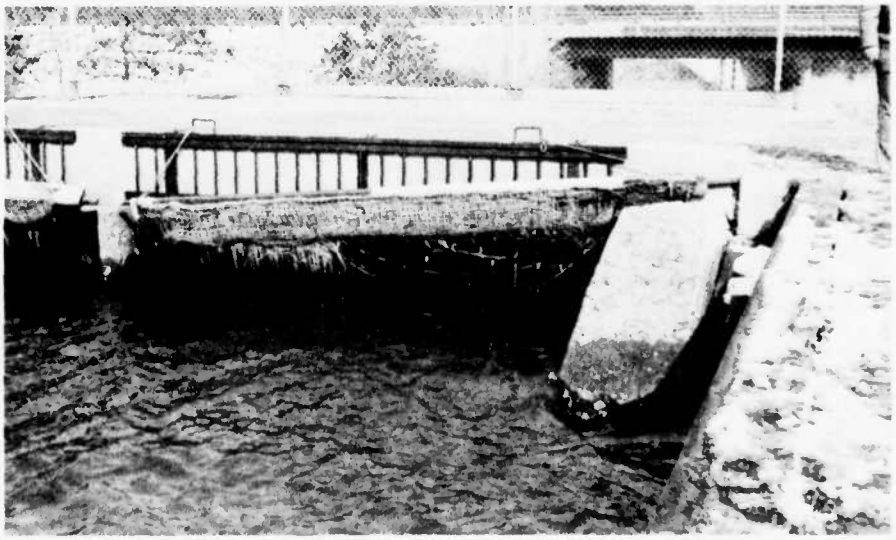
E. P. A. PROJECT No. 1-B13-7.
PROPOSED DAM AND SPILLWAY
ATLANTIC CITY WATERSHED
EGG HARBOR TWP.
ATLANTIC CO. N.J.

FIGURE 6

APPENDIX

PHOTOGRAPHS

UPSTREAM FACE OF DAM



CRACKING AND DIFFERENTIAL SETTLEMENT OF
CONCRETE ALONG THE SPILLWAY

CHANNEL DOWNSTREAM OF SPILLWAY

SLOPE PROTECTION ALONG UPSTREAM FACE

FIELD INSPECTION REPORT

Check List
Visual Inspection
Phase 1

Name Dam Doughty Pond Upper Dam County Atlantic State New Jersey Coordinators Larry Woscyna . New Jersey DEP

Date(s) Inspection 3/17/78 Weather Clear Temperature 30°

Pool Elevation at Time of Inspection 25.3 M.S.L. Tailwater at Time of Inspection _____ M.S.L.

Inspection Personnel:

Mr. John J. Williams Mr. David Campbell

Mr. Lee DeHeer

Mr. George Elias

Mr. David Campbell Recorder

Accompanied by:

Mr. Anthony J. Iarrobino, Soils Engineer, Technical Engineering Division, U.S. Army Corps of Engineers, North Atlantic Division
Col.Weinburg, Reserve Officer, U.S. Army Corps of Engineers, North Atlantic Division
Mr. Larry Woscyna, Civil Engineer, New Jersey Department of Environmental Protection

EMBANKMENT

SUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RFACE CRACKS	None Noted	None
USUAL MOVEMENT OR ACKING AT OR BEYOND E TOE	None Noted	None
OUGHING OR EROSION OF BANKMENT AND ABUTMENT OPES	Some minor erosion along the right side of the reservoir about 100 feet upstream of the embankment.	Erosion is due to badly cracked and spalled slope protection, but poses no problem since it is not near the embankment.
RTICAL AND HORIZONTAL INEMENT OF THE CREST	No problems noted	None
PRAP FAILURES	One foot square concrete blocks mortared into place. Some dispacement and minor spalling has occurred.	The spalling appears to be surficial.

EMBANKMENT

SUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
UNCTION OF EMBANKMENT ND ABUTMENT, SPILLWAY ND DAM	Differential settlement of up to 3 inches was noted at the junction of the spillway and embankment at both the left and the right sides.	The settlement areas should be monitored periodically to detect any further movement.
NY NOTICEABLE SEEPAGE	A seepage area was noted about 30 feet below the embankment and about 150 feet to the left of the spillway. The seepage was rust colored and flowed parallel to the embankment to the discharge channel below the spillway.	The seepage should be monitored closely and the flow rate determined. If determined to be serious, appropriate remedial action should be taken.
TAFF GAGE AND RECORDER	None	None
RAINS	None Noted	None

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None	None
INTAKE STRUCTURE	None Noted	None
OUTLET STRUCTURE	24 inch drain pipes are located adjacent to the spillway near each wing wall. The operating handles or wheels and stems for the gates in these lines were not in place.	Gate handles or wheels and stems should be available to allow draw-down of the reservoir if necessary.
OUTLET CHANNEL	Same as spillway discharge channel.	None
EMERGENCY GATE	None	None

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	A considerable amount of spalling and cracking has occurred on the spillway wing walls. The spillway floor appears to be in good condition, but it was observed under flow conditions.	The spillway wing walls should be replaced or repaired.
APPROACH CHANNEL	None	None
DISCHARGE CHANNEL	Waterdischarges down the spillway, across an apron and into a channel about 60 feet wide. See photograph on page A2.	None
BRIDGE AND PIERS	The spillway is bridged, with the bridge supported by the wing walls and a center pier. The pier is streamlined to minimize hydraulic losses.	The bridge allows a 2-foot vertical opening for discharge.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes are very mild and present no hazard to the safety of the structure.	None
SEDIMENTATION	No sedimentation problems were noted.	None

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	About 200 feet below the spillway, flow is directed under twin Garden State Parkway Bridges. The opening is estimated to be 80 feet wide and 20 feet high.	None
SLOPES	The slopes are mild and no problems were observed.	None
APPROXIMATE NO. OF HOMES AND POPULATION	The Absalom Doughty Reservoir is located 15 miles downstream of the Doughty Pond Upper Dam. No homes are located above the Absalom Doughty Dam.	None

ITEM	REMARKS
DESIGN REPORTS	Several plan and section drawings of the proposed structure and correspondence concerning the design as reviewed by the New Jersey State Water Policy Commission.
GEOLOGY REPORTS	See Section 6.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	PMF - Inflow peak (12,500 cfs), outflow peak (11,900 cfs - 3.0 feet above the spillway crest). 500-year flood - Inflow peak (2,600 cfs), outflow peak (1,900 cfs-0.8 feet above the spillway crest. Both discharges cause overtopping of the embankment. The safety of the dam is questionable, even for normal pool elevations. No seepage studies have been made.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None
POST-CONSTRUCTION SURVEYS OF DAM	None Available
BORROW SOURCES.	Local

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None Available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Visual inspection reports of the dam dated August 1, 1969, September 5, 1944 and April 22, 1942.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	None Available.

HYDROLOGIC AND HYDRAULIC CALCULATIONS

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PHILADELPHIA, PA

SHEET NO. 1 OF _____
DATE 3/22/78
COMP. BY DFC
CHECKED BY LW

NAME OF CLIENT Corps of Engrs.
PROJECT Upper Roughty Dam

DRAINAGE AREA = 8.7 SQ. MI.

UNIT HYDROGRAPH

ESTIMATION OF T_c

Bureau of Public Roads

$$T_c = \left(\frac{11.9\,L^3}{H}\right)^{.385}$$

L = 4.55 MILES, H = 50 FEET

T_c = 3.31 HOURS = 200 MINUTES

Kirpich Method

AVERAGE OVERLAND SLOPE = 4.9%

OVERLAND LENGTH = 4000 FEET

VELOCITY = 2.5 FPS

T_t = 4000 FEET / 2.5 FPS = 1600 SEC = 26.66 MINUTES

CHANNEL LENGTH = 29,000 FEET

AVERAGE SLOPE = .0017

AVERAGE 'n' VALUE = .04

R = 1.5 FEET $\therefore V = \frac{1.5}{n} R^{2/3} S^{1/2}$ = 2.45 FPS

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SHEET NO. 2 OF
DATE 3/23/78
COMP. BY DBC
CHECKED BY LW

NAME OF CLIENT CORPS OF ENGRS.
PROJECT UPPER DOUGHTY DAM

T_{t2} = 20,000 FEET / 2.45 FPS = 8160 SEC = 2.27 HOURS

$T_c = T_{t1} + T_{t2}$ = 4.44 + 2.27 = 6.7 HOURS = 400 MIN.

USE UPLAND METHOD

T_c = 6.7 HOURS = 403 MIN

HYDROGRAPH PARAMETERS

$T_p = D/2 + .6\,T_c$ if $D \simeq .15\,T_c$ = 1 HOUR OR 60 MIN

T_p = 30 + .6 × 450 = 300 MINUTES

$Q_p = 484\,A / T_p$ = 842 CFS

RUNOFF: CURVE NUMBER

SOIL IS PRIMARILY RESIDUAL SANDS & GRAVELS, EVIDENCE OF UNDERLYING HARDPAN. (SOIL GROUP B).

15%	IMPERVIOUS	95
5%	MARSH	85
20%	MEADOW (FAIR)	62
55%	WOODLAND (POOR)	63
5%	RESERVOIR	99

AVERAGE CN = .15 × 95 + .05 × 85 + .20 × 62 + .55 × 63 + .05 × 99

= 71

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PHILADELPHIA, PA

SHEET NO. 3 OF

DATE 3/23/79

NAME OF CLIENT CORPS OF ENGRS.

COMP. BY DBC

PROJECT UPPER DUQUESNE DAM

CHECKED BY LW

T/Tp	q/qp	T (HOURS)	q, cfs	q (adjusted)
0	0.00	0	0	0
.1	0.015	.5	12	12
.2	0.075	1.0	66	66
.3	0.16	1.5	135	132
.4	0.28	2.0	236	232
.5	0.43	2.5	362	356
.6	0.60	3.0	505	497
.7	0.77	3.5	649	638
.8	0.89	4.0	750	738
.9	0.97	4.5	817	804
1.0	1.00	5.0	842	829
1.1	0.93	5.5	825	812
1.2	0.92	6.0	775	763
1.3	0.84	6.5	707	696
1.4	0.75	7.0	632	622
1.5	0.66	7.5	556	547
1.6	0.56	8.0	472	464
1.8	0.42	9.0	354	348
2.0	0.32	10.0	269	265
2.2	0.24	11.0	202	199
2.4	0.18	12.0	152	150
2.6	0.12	13.0	101	107
2.8	0.098	14.0	82	81
3.0	0.075	15.0	63	62
3.5	0.026	17.5	22	22
4.0	0.013	20.0	11	11
4.5	0.008	22.5	7	7
5.0	0.004	25.0	3	3
5.5	0.00	27.5	0	0

1.016"

1"

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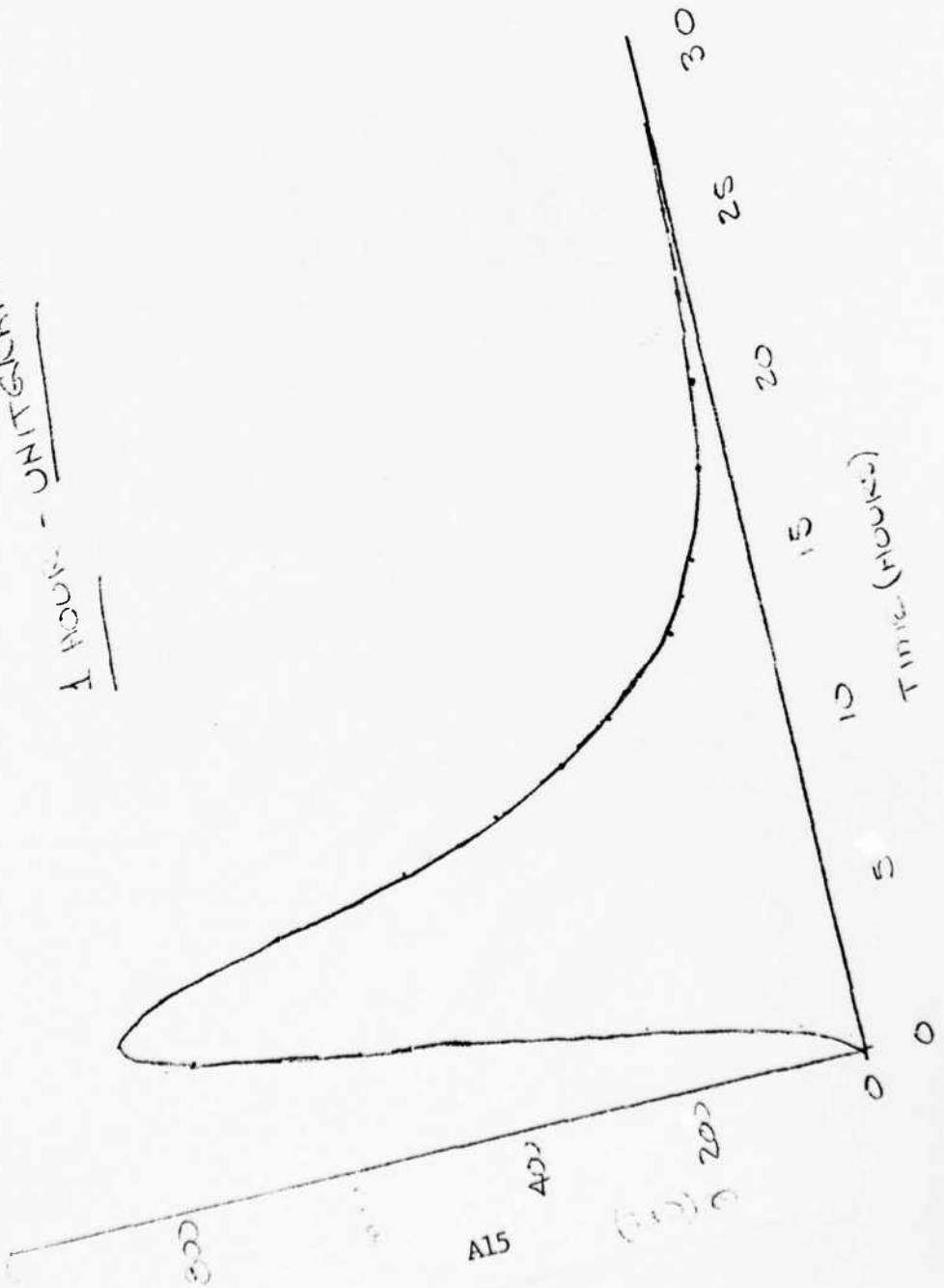
SHEET NO. 4 OF
DATE 3/23/78
COMP. BY DBC
CHECKED BY LW

CLIENT CORPS OF ENGRS.
UPPER DOUGHTY DAM

1 HOUR - UNITGRAPH



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PHILADELPHIA, PA

SHEET NO. 4 OF ____

NAME OF CLIENT CORPS OF ENGRS.

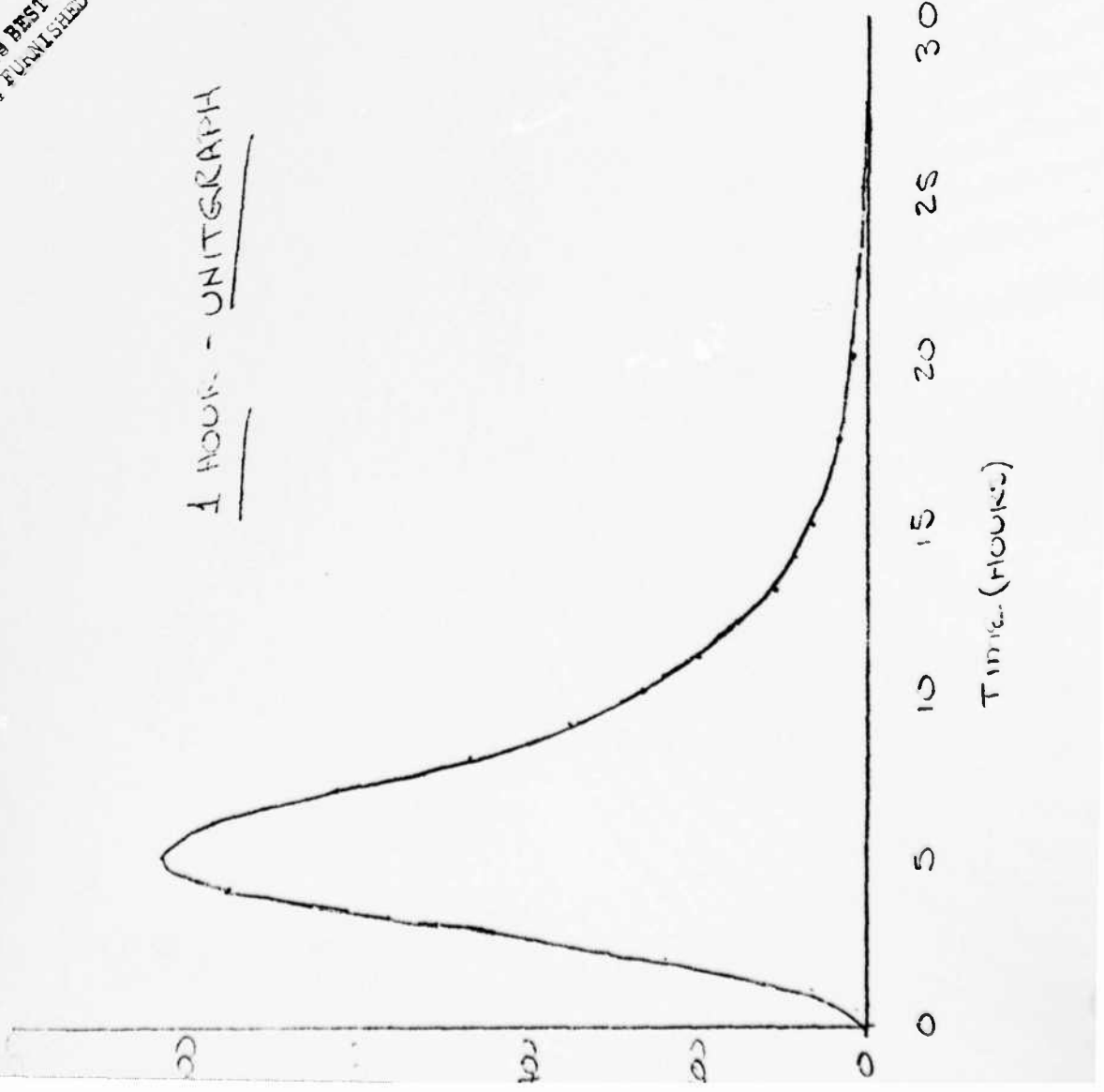
DATE 3/23/78

PROJECT UPPER DOUGHTY DAM

COMP. BY DBC

CHECKED BY LW

1 HOUR - UNITGRAPH



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PHILADELPHIA, PA

SHEET NO. _____ OF _____

NAME OF CLIENT Corps of Engrs

DATE 4/31-78

COMP. BY DG

PROJECT Upper Dauphin Dam

CHECKED BY LW

PMF FLOOD COMPUTATION (UPPER DAM)

6HR PMP RAINFALL = 26"

20% REDUCTION FACTOR FOR PROBABLE MISALIGNMENT OF BASIN AND STORM ISOHYETALS, 20 —

ADJUSTED 6HR PMP = 20.8"

TIME (HOUR)	PMP RAINFALL # %	Σ	Incr.	RUNOFF Σ	Incr.	Losses Σ	Incr.
1	8	1.7	1.7	.2	.2	1.5	1.5
2	9	3.5	1.8	1.1	.9	2.4	.9
3	11	5.8	2.2	2.7	1.6	3.1	.7
4	49	16.0	10.2	12.0	9.3	4.0	.9
5	15	19.1	3.1	14.9	2.9	4.2	.2 *
6	8	20.3	1.7	16.4	1.5	4.4	.2 *

THIRD QUARTILE
* MINIMUM LOSS RATE

STAGE - STORAGE RELATION

AREA @ ELEV 25 = 130 ACRES } FROM USGS QUAD
AREA @ ELEV 30 = 300 ACRES }

ASSUME A LINEAR VARIATION IN SURFACE AREA FROM ELEV 25 TO ELEV 30

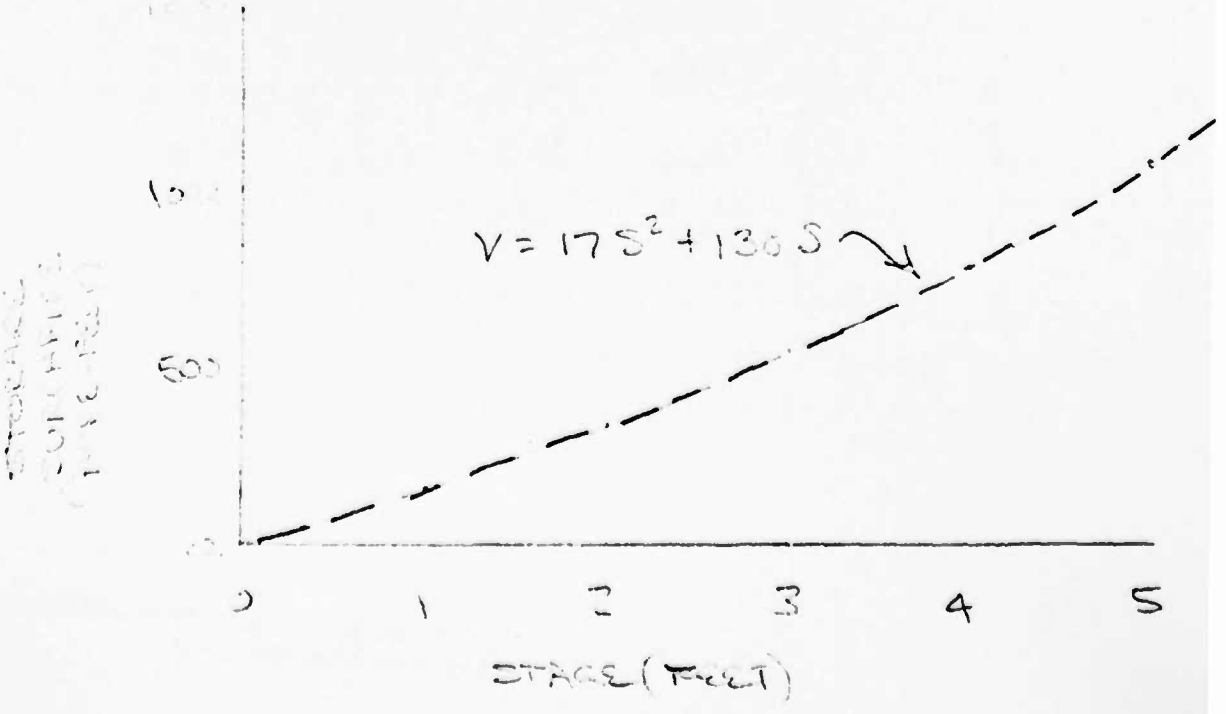
LET STAGE(S) = 0 @ ELEV = 25

$A(0) = 130 \qquad A(5) = 300$

$\therefore A = 34S + 130$

$V = \int_0^S (34S + 130)\,dS = 17S^2 + 130S + C$

$V(0) = 0 \quad \therefore C = 0$



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PHILADELPHIA, PA

SHEET NO. 8 OF
DATE 3/24/78
COMP. BY DBC
CHECKED BY

NAME OF CLIENT CORPS OF ENGRS
PROJECT UPPER DELAWARE DAM

STAGE - DISCHARGE RELATION

OGEE SPILLWAY (BROAD-CRESTED)
25' WIDE WITH 1' WIDE BRIDGE PIER
EFFECTIVE WIDTH = 24'
VERTICAL OPENING IS 2' TO BRIDGE GIRDERS

$Q = CLH^{3/2}$ $C = 3.1$ $L = 24'$ $Q = 74.4\,H^{3/2}$

FROM ELEV. 27' TO ELEV. 28' (PRESSURE FLOW)

$Q = CA\sqrt{2gH}$ $C = .55$

$Q = .55 \times 2 \times 24 \times \sqrt{2g} \times \sqrt{H} = 211 \times H^{.5}$

ABOVE ELEV. 28' PRESSURE FLOW AND OVERFLOW ACROSS CREST OF DAM.

$L = 750'$ $C = 3.0$

$Q = CLH^{3/2} = 2250\,H^{3/2}$

STAGE	DISCHARGE	STAGE	DISCHARGE
0	0	3.0	298
.5	26	4.0	2615
1.0	74	5.0	6786
1.5	137	6.0	12160

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SHEET NO. 9 OF ____
DATE 3/24/78
COMP. BY DBC
CHECKED BY LW

NAME OF CLIENT CORPS OF ENGRS.
PROJECT UPPER DOUGHTY DAM

STORAGE -DISCHARGE RELATION
(HEC-1 INPUT)

STORAGE	DISCHARGE
0	0
70	26
147	74
233	137
328	210
546	298
790	2615
1075	6786
1396	12160
1740	18520

THE PEAK DISCHARGE FROM RESERVOIR IS ABOU
12 [illegible] CFS, OR A STAGE OF 6 FEET (3.0 FEET ABOVE
THE TOP OF DAM).

½ PMF PEAK DISCHARGE FROM RESERVOIR IS ABOUT 5700
OR A STAGE OF 4.8 FEET (1.8 FEET ABOVE THE
TOP OF DAM).

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PHILADELPHIA, PA

SHEET NO. 10 OF _____
DATE 4/10/78
COMP. BY DRC
CHECKED BY LW

NAME OF CLIENT CORPS OF ENGRS.
PROJECT UPPER DELAWARE DAM

RESERVOIR DRAWDOWN :

TWO 24" C.I.P.

ASSUME OUTLET CONTROL & CULVERT FLOWING FU

$$H = \frac{V^2}{2g} + K_e \frac{V^2}{2g} + K_v \frac{V^2}{2g} + h_f$$

H = UPSTREAM HEAD

K_e = ENTRANCE LOSS COEF.

K_v = VALVE LOSS COEF.

$$h_f = \frac{29 n^2 L}{R^{1.33}} \times \frac{V^2}{2g} \quad \& \quad \frac{V^2}{2g} = \frac{Q^2}{2g\frac{D^2}{4}\pi}$$

$$H = \left[1 + K_e + K_e + \frac{29 n^2 L}{\left(\frac{D}{4}\right)^{1.33}}\right] \frac{Q^2}{2g\frac{\pi}{4}D^2}$$

$$H = \left[1 + .1 + .1 + \frac{29 \times .01^2 \times 100}{.5^{1.33}}\right] \frac{Q^2}{2g\frac{\pi}{4}2^2}$$

$$H = .00959\,Q^2 \qquad Q = 10.24\,H^{1/2} \text{ per pipe}$$

$$\therefore Q_T = 20.48 H^{1/2}$$

H(FT)	12	10	8	6	4	2
Q(CFS)	71	65	58	50	41	29

JUSTIN & COURTNEY, INC.
Division of O'Brien & Gere Engineers, Inc.
PHILADELPHIA, PA

SHEET NO. 11 OF ___

NAME OF CLIENT CORPS OF ENGRS

DATE 4/10/78

PROJECT UPPER DOUGHTY DAM

COMP. BY DBC

CHECKED BY LW

ASSUME A LINEAR VARIATION IN SURFACE AREA FROM 130 ACRES AT THE CREST OF THE SPILLWAY TO ZERO ACRES TEN FEET BELOW.

$A(0) = 0 \qquad A(12) = 130$

$A = KH \quad \therefore K = 130/10 = 13.0$

H_{AVE} (FEET)	ΔH (FEET)	Q_{AVE} (CFS)	$AREA_{AVE}$ (ACRES)	Δt (HOURS)	$\Sigma \Delta t$ (HOURS)
12	2	71	117	40	40
10	2	65	91	34	74
8	2	58	65	27	101
6	2	50	39	19	120
4	2	41	13	8	128

****
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
****

DOUGHTY POND UPPER DAM
NATIONAL DAM SAFETY PROGRAM
PROBABLE MAXIMUM FLOOD COMPUTATION

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
50	1	0	1	0	0	0	2	2	0

JOPER NWT
3 0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	8.70	0.00	0.00	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
6	0.00	0.00	0.00

PRECIP PATTERN

.20	.90	1.60	9.30	2.90	1.50

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

GIVEN UNIT GRAPH, NUHGO= 28

0.	62.	232.	497.	719.	829.	763.	622.	465.	348.
265.	199.	150.	107.	82.	62.	49.	36.	27.	21.
15.	12.	9.	7.	5.	3.	2.	0.		

UNIT GRAPH TOTALS 5607. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

			TIME	RAIN	EXCS	COMP Q
1	1	0		.20	.20	0.
1	2	0		.90	.90	12.
1	3	0		1.60	1.60	102.
1	4	0		9.30	9.30	407.
1	5	0		2.90	2.90	1543.
1	6	0		1.50	1.50	3963.
1	7	0		0.00	0.00	7467.
1	8	0		0.00	0.00	10790.
1	9	0		0.00	0.00	12460.
1	10	0		0.00	0.00	12090.
1	11	0		0.00	0.00	10351.
1	12	0		0.00	0.00	8108.
1	13	0		0.00	0.00	6151.

1	14	0	0.00	0.00	4646.
1	15	0	0.00	0.00	3494.
1	16	0	0.00	0.00	2627.
1	17	0	0.00	0.00	1975.
1	18	0	0.00	0.00	1448.
1	19	0	0.00	0.00	1091.
1	20	0	0.00	0.00	845.
1	21	0	0.00	0.00	635.
1	22	0	0.00	0.00	479.
1	23	0	0.00	0.00	364.
2	0	0	0.00	0.00	270.
2	1	0	0.00	0.00	208.
2	2	0	0.00	0.00	157.
2	3	0	0.00	0.00	120.
2	4	0	0.00	0.00	87.
2	5	0	0.00	0.00	56.
2	6	0	0.00	0.00	35.
2	7	0	0.00	0.00	10.
2	8	0	0.00	0.00	3.
2	9	0	0.00	0.00	0.
2	10	0	0.00	0.00	0.
2	11	0	0.00	0.00	0.
2	12	0	0.00	0.00	0.
2	13	0	0.00	0.00	0.
2	14	0	0.00	0.00	0.
2	15	0	0.00	0.00	0.
2	16	0	0.00	0.00	0.
2	17	0	0.00	0.00	0.
2	18	0	0.00	0.00	0.
2	19	0	0.00	0.00	0.
2	20	0	0.00	0.00	0.
2	21	0	0.00	0.00	0.
2	22	0	0.00	0.00	0.
2	23	0	0.00	0.00	0.
3	0	0	0.00	0.00	0.
3	1	0	0.00	0.00	0.
3	2	0	0.00	0.00	0.
		SUM	16.40	16.40	91952.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	12469.	10213.	3819.	1839.	91955.
INCHES		10.92	16.33	16.39	16.39
AC-FT		5067.	7578.	7603.	7603.

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	0.	70.	147.	233.	328.	540.	790.	1075.	1390.	1740.
OUTFLOW=	0.	26.	74.	137.	210.	299.	2615.	6786.	12160.	18520.

	TIME	EOP STOR	AVG IN	EOP OUT
1	1 0	0.	0.	0.
1	2 0	1.	6.	0.
1	3 0	5.	57.	2.

1	4	0	26.	255.	10.
1	5	0	104.	975.	47.
1	6	0	321.	2753.	205.
1	7	0	708.	5715.	1857.
1	8	0	1093.	9129.	7091.
1	9	0	1313.	11630.	10844.
1	10	0	1382.	12280.	12031.
1	11	0	1343.	11221.	11361.
1	12	0	1240.	9229.	9598.
1	13	0	1120.	7129.	7557.
1	14	0	1012.	5399.	5852.
1	15	0	920.	4070.	4511.
1	16	0	845.	3060.	3418.
1	17	0	785.	2276.	2573.
1	18	0	732.	1687.	2082.
1	19	0	684.	1270.	1632.
1	20	0	644.	968.	1264.
1	21	0	613.	740.	974.
1	22	0	588.	557.	743.
1	23	0	569.	421.	565.
2	0	0	554.	317.	427.
2	1	0	543.	239.	323.
2	2	0	532.	183.	295.
2	3	0	520.	139.	290.
2	4	0	504.	104.	283.
2	5	0	487.	72.	226.
2	6	0	469.	45.	268.
2	7	0	449.	23.	260.
2	8	0	429.	7.	252.
2	9	0	408.	2.	243.
2	10	0	388.	0.	235.
2	11	0	369.	0.	227.
2	12	0	350.	0.	219.
2	13	0	333.	0.	212.
2	14	0	316.	0.	200.
2	15	0	299.	0.	188.
2	16	0	284.	0.	177.
2	17	0	270.	0.	166.
2	18	0	257.	0.	155.
2	19	0	245.	0.	146.
2	20	0	233.	0.	137.
2	21	0	222.	0.	129.
2	22	0	212.	0.	121.
2	23	0	202.	0.	114.
3	0	0	193.	0.	107.
3	1	0	184.	0.	101.
3	2	0	176.	0.	95.
	SUM				89874.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	12031.	9747.	3589.	1797.	89874.
INCHES		10.42	15.35	16.02	16.02
AC-FT		4836.	7121.	7431.	7431.

RUNOFF SUMMARY, AVERAGE FLOW

HYDROGRAPH AT		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
	1	12469.	10217.	3819.	1839.	8.70
ROUTED TO	2	12031.	9747.	3589.	1797.	8.70

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HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
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DOUGHTY POND UPPER DAM
NATIONAL DAM SAFETY PROGRAM
1/2 PROBABLE MAXIMUM FLOOD COMPUTATION

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
50	1	0	1	0	0	0	2	2	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	8.70	0.00	0.00	0.00	0.000	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
6	0.00	0.00	0.00

PRECIP PATTERN

.10	.45	.80	4.65	1.45	.75

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

GIVEN UNIT GRAPH, NUHGO= 25

0.	62.	232.	497.	738.	823.	763.	622.	465.	348.
265.	199.	150.	107.	82.	62.	49.	36.	27.	21.
15.	12.	9.	7.	5.	3.	2.	0.		

UNIT GRAPH TOTALS 5607. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

	TIME	RAIN	EXCS	COMP Q
1	1 0	.10	.10	0.
1	2 0	.45	.45	6.
1	3 0	.80	.80	51.
1	4 0	4.65	4.65	204.
1	5 0	1.45	1.45	771.
1	6 0	.75	.75	1981.
1	7 0	0.00	0.00	3734.
1	8 0	0.00	0.00	5395.
1	9 0	0.00	0.00	6234.
1	10 0	0.00	0.00	6045.
1	11 0	0.00	0.00	5176.

1	14	0	0.00	0.00	2323.
1	15	0	0.00	0.00	1747.
1	16	0	0.00	0.00	1314.
1	17	0	0.00	0.00	963.
1	18	0	0.00	0.00	724.
1	19	0	0.00	0.00	546.
1	20	0	0.00	0.00	422.
1	21	0	0.00	0.00	318.
1	22	0	0.00	0.00	239.
1	23	0	0.00	0.00	182.
2	0	0	0.00	0.00	135.
2	1	0	0.00	0.00	104.
2	2	0	0.00	0.00	79.
2	3	0	0.00	0.00	60.
2	4	0	0.00	0.00	43.
2	5	0	0.00	0.00	28.
2	6	0	0.00	0.00	17.
2	7	0	0.00	0.00	5.
2	8	0	0.00	0.00	2.
2	9	0	0.00	0.00	0.
2	10	0	0.00	0.00	0.
2	11	0	0.00	0.00	0.
2	12	0	0.00	0.00	0.
2	13	0	0.00	0.00	0.
2	14	0	0.00	0.00	0.
2	15	0	0.00	0.00	0.
2	16	0	0.00	0.00	0.
2	17	0	0.00	0.00	0.
2	18	0	0.00	0.00	0.
2	19	0	0.00	0.00	0.
2	20	0	0.00	0.00	0.
2	21	0	0.00	0.00	0.
2	22	0	0.00	0.00	0.
2	23	0	0.00	0.00	0.
3	0	0	0.00	0.00	0.
3	1	0	0.00	0.00	0.
3	2	0	0.00	0.00	0.
		SUM	8.20	8.20	45974.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6234.	5106.	1909.	920.	45977.
INCHES		5.46	8.17	8.18	8.19
AC-FT		2531.	3789.	3802.	3802.

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HYDROGRAPH ROUTING

ISTAQ	ICOMP	ICONN	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	0.	70.	147.	231.	329.	540.	790.	1075.	1390.	1740.
OUTFLOW=	0.	26.	74.	137.	210.	298.	2615.	6786.	12160.	18520.

	TIME FOR STOR	AVG IN	FOR OUT
1 1 0	0.	0.	0.

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1	4	0	13.	127.	3.
1	5	0	52.	489.	19.
1	6	0	162.	1376.	85.
1	7	0	385.	2859.	234.
1	8	0	685.	4564.	1637.
1	9	0	914.	5815.	4433.
1	10	0	1002.	6140.	5719.
1	11	0	997.	5619.	5637.
1	12	0	944.	4615.	4867.
1	13	0	877.	3565.	3885.
1	14	0	816.	2699.	2991.
1	15	0	763.	2035.	2362.
1	16	0	713.	1530.	1901.
1	17	0	667.	1139.	1479.
1	18	0	629.	843.	1127.
1	19	0	600.	635.	854.
1	20	0	578.	484.	649.
1	21	0	561.	370.	495.
1	22	0	548.	278.	375.
1	23	0	538.	211.	297.
2	0	0	527.	158.	292.
2	1	0	513.	119.	287.
2	2	0	497.	91.	280.
2	3	0	480.	69.	273.
2	4	0	462.	52.	265.
2	5	0	441.	36.	258.
2	6	0	424.	23.	250.
2	7	0	405.	11.	242.
2	8	0	385.	3.	234.
2	9	0	366.	1.	226.
2	10	0	348.	0.	218.
2	11	0	330.	0.	211.
2	12	0	313.	0.	199.
2	13	0	297.	0.	186.
2	14	0	282.	0.	175.
2	15	0	268.	0.	164.
2	16	0	255.	0.	154.
2	17	0	243.	0.	145.
2	18	0	231.	0.	136.
2	19	0	220.	0.	128.
2	20	0	210.	0.	120.
2	21	0	200.	0.	113.
2	22	0	191.	0.	107.
2	23	0	183.	0.	100.
3	0	0	175.	0.	94.
3	1	0	167.	0.	89.
3	2	0	160.	0.	84.
	SUM				44082.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5719.	4589.	1702.	882.	44082.
INCHES		4.91	7.28	7.86	7.86
AC-FT		2277.	3378.	3645.	3645.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	6234.	5106.	1903.	920.	8.70
ROUTED TO	2	5713.	4599.	1702.	882.	8.70

PREVIOUS INSPECTION REPORTS

Report on Dam Inspection

UPPER DOUGHTY POND

APPLICATION NO. 248

DAM NO. 36-9

LOCATION 36.3.7.9.4

On April 20, 1942, in company with Mr. Max Grossman, Superintendent of the Atlantic City Water Department, inspection was made of this dam of the Atlantic City Water Department on Absecon Creek, one mile upstream of Lower Doughty Pond.

The dam is in satisfactory condition. The earth embankment shows little or no erosion, and the cement block paving on the upstream face of the dam is in excellent condition.

Many feet of concrete wall have been built along the edges of the pond to prevent erosion of the banks by wave action.

The pond was 1.25 feet below the spillway level and no water was being discharged at the time of inspection because of the channel work downstream, described below.

At the right-hand side of the spillway channel, just below the spillway, a 10-inch drain enters, which, during storms, discharges surface water from catch basins which have been placed at the downstream side of the right end of the dam embankment. In dry weather, as at the time of the inspection, this pipe discharges a small flow, which represents seepage through the right-hand half of the dam embankment. The flow at the outlet of this 10-inch pipe was 5/8 of an inch deep at the time of inspection.

The Atlantic City Water Department is now constructing a channel 52 feet wide, having concrete side walls and sand bottom, from the spillway channel at the upper pond to the head of the lower pond. This channel is 50% complete, and is a very good job.

Inspection was made of the spring, which is located on the left-hand side of the flood plain, about 1,000 feet downstream from the dam, and the flow from this spring was estimated to be at the same rate as observed before the construction of the dam, indicating very little seepage past the dam.

The condition at this dam is satisfactory and no action is required.

John M. Brooks

Memorandum re

UPPER DOUGHTY POND

WEST BRANCH ABSECON CREEK, ATLANTIC COUNTY

APPLICATION NO. 248

DAM NO. 36-9

On August 29, 1944 Mr. H. T. Critchlow, Chief Engineer, ruled that no further inspection was necessary of the Upper Doughty Pond Dam, approved for the City of Atlantic City on January 9, 1935 and completed September 9, 1936.

On January 6, 1938 John N. Brooks, Assistant Division Engineer, reported that the structure was satisfactory but recommended that acceptance be withheld until June 1938 so as to check seepage through the embankment. On April 20, 1942 Mr. Brooks reported that the dam was in satisfactory condition.

The file for this application can therefore be considered closed.

Trenton, N. J.
Sept. 5, 1944

George R. Shanklin
Senior Hydraulic Engineer

ANNUAL REPORT - DAMS

Application No. 248 For Year: 1969

Name of Dam Doughty Date of Inspection 8-1-69

Owner City of Atlantic City- Water Department

Address City Hall Room 103
Atlantic City, New Jersey 08401

Description of Condition of the following:

1. Embankment (Erosion) (Seepage, etc.)

No evidence at this time.

2. Spillway (Concrete spalling, timber rotting, leakage, etc.)

No evidence of any deteriorating condition.

3. Emergency Spillway (Erosion, growth of sod, riprap, etc.)

No evidence of growth or deterioration.

4. Outlet Works (Operational condition of valves or grates, condition of pipe, et
1 - 36" Valve at spillway in need of repairs to stem.
Pipe in satisfactory condition.

5. Inlet Streams (Silt deposition, etc.)
Deposition of silt normal no heavy accumulation.
Upper streams are cleaned regularly by the National Aviation Facilities Experimental Center (N.A.F.E.C.) personnel.

6. Outlet stream (Scouring, undercutting of dam, condition of stilling basin, et
No evidence of any deterioration as illustrated in parenthesis.
Stilling basin in satisfactory condition.

7. General

a. Did flood waters overtop dam during period of report?
If so, at what stage and date thereof.
Reservoir filled to capacity and spilling over the entire twelve (12) month period preceeding this report.

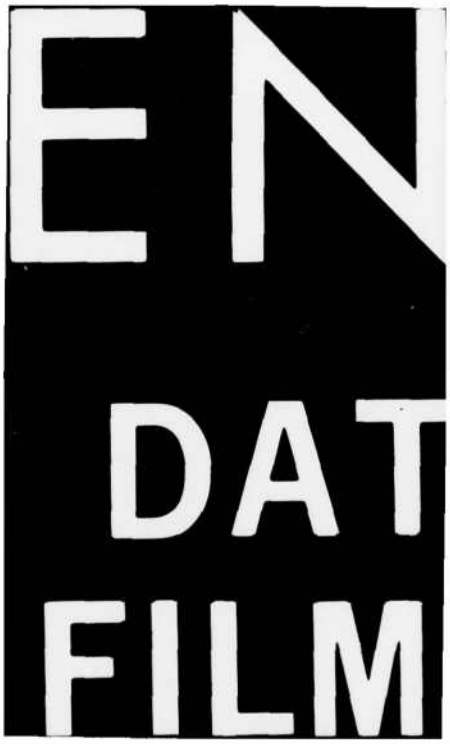
b. Report on any other condition not covered above.
Walkway on top of embankment in need of concrete repairs.

c. In your opinion, does existing condition warrent repairs? YES
If so, where and to what extent.
Walkway along top of embankment in need of repairs to concrete with some fill needed to bring to grade.

d. Photographs of the upstream and downstream faces of the embankment main spillway and emergency spillway noting dates taken.
See Attached Photos

Inspected by:

William P. McLees, Ass't. Supt. & Engr.
Date: August1 ,1969.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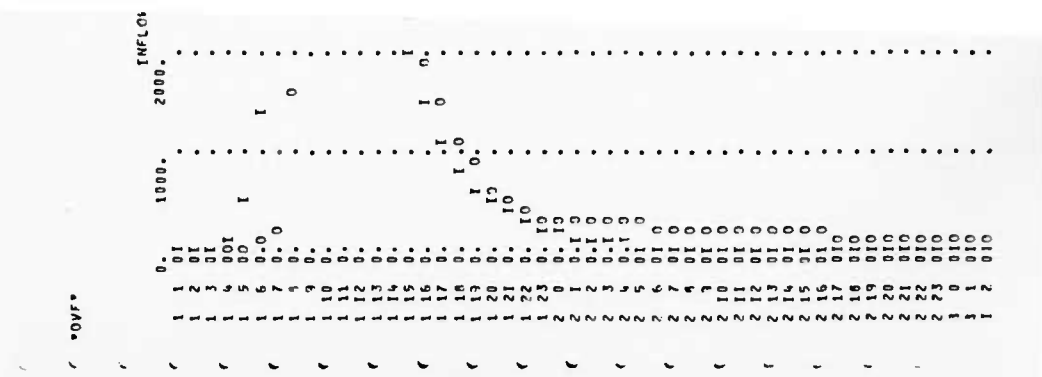
STORAGE=
OUTFLOW=

A23

A25



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ROUTED T

A31

[redacted]

channel 52 feet wide, having concrete side walls and sand bottom, from the spillway channel at the upper pond to the head of the lower pond. This channel is 50% complete, and is a very good job.

Inspection was made of the spring, which is located on the left-hand side of the flood plain, about 1,000 feet downstream from the dam, and the flow from this spring was estimated to be at the same rate as observed before the construction of the dam, indicating very little seepage past the dam.

The condition at this dam is satisfactory and no action is required.

Trenton, New Jersey
April 22, 1942

A32

John M. Brooks,
Assistant Division Engineer

If so, where and to what extent.
Walkway along top of embankment in need of repairs to concrete with some fill needed to bring to grade.

d. Photographs of the upstream and downstream faces of the embankment main spillway and emergency spillway noting dates taken.
See Attached Photos

Inspected by:

William P. McLees, Ass't. Supt. & Engr.
Date: August1 ,1969.